

The Chemical Age

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Notes and Comments

Empire Selling Methods

IT was a happy coincidence that Dr. E. F. Armstrong's statesmanlike speech to the Association of British Chemical Manufacturers should have been reported in the same issue of THE CHEMICAL AGE as that in which we published preliminary details of the agreements reached at the Imperial Economic Conference at Ottawa. Dr. Armstrong had delivered his speech a week before the publication of the agreements and had clearly indicated that new opportunities were to be afforded by the Ottawa deliberations for the development of the chemical trade within the Empire, but it was not until the details of the preferences were available that the full significance of the policy outlined by Dr. Armstrong could be fully appreciated. Now that the chemical manufacturers of this country are acquainted with the extent to which Canada in particular, and many of the other Dominions in general, are prepared to accord preferential treatment to British imports there will be increased support for the principle of organising our selling methods on more enterprising lines. Dr. Armstrong, with other representatives of British chemical interests, has made an intimate study of Canadian industrial problems during the past few months, and he is convinced of the necessity for the chemical industry entering the Dominion as one sales organisation, representing a number of houses which will sell to it on an agreed basis approximating to cost, and share in the expenses and profits according to their respective turnover or other convenient plan.

We need not here dilate upon the advantages of such an arrangement, which were ably outlined by Dr. Armstrong, but a point worth noting in his proposition is that increased trade will not come from Ottawa of its own volition. The Empire markets must be entered boldly if at all with a good deal of initial expenditure, otherwise they are best left alone. The present is an opportune moment to begin to attack them, with the possibility that the depression has ended and with the knowledge that the British goodwill arising out of Ottawa, together with the concession secured, will be of enormous help in building up the new organisation in the interests of British trade.

Future of the A.B.C.M.

THE Association of British Chemical Manufacturers has amply justified its existence by the usefulness of its work during the past sixteen years, but there is still much work to be done. At the time of its formation several other associations for special purposes connected with the chemical trade were in being. Some of these have lapsed and transferred their functions to

the A.B.C.M. New associations have arisen, almost always in the closest touch with the A.B.C.M. and making full use of its office and its organisation. It may be that some of these could be more closely welded into the Association, but at present they are working well. The Association and its council have become expert in knowing how to present a case to the Government, and, generally speaking, they are better qualified to do so where the official mind is concerned than the expert representative of an individual firm, who is prone to be too technical and too cognisant of his grievances. Dr. Armstrong is of the opinion that the Association should not be content with defence, but should increase its efforts in offence. Whilst he admires the work of the larger chemical concerns he realises that there is a large field still to be covered by the smaller chemical firms. The individuality of these should be maintained, for there is room even for the smallest unit so long as it is efficient, though when it comes to entering Empire and world markets some form of central marketing organisation is desirable.

In the most peaceful times the chairmanship of the Association is no sinecure, and in the past twelve months it has been more than usually obvious. Throughout the year Dr. Armstrong has given more time to the affairs of the Association than any chairman who has preceded him as he has been not only chairman of the Council but also chairman of the Works Technical Committee and also of the new Chemical Division of the British Standards Institution. Moreover, he gave up two months of his valuable time during the summer to go with Mr. J. Davidson Pratt, general manager and secretary of the Association, to the Ottawa Conference on behalf of the chemical industry.

Safety in Industry

THE prevention of industrial sickness and disease was the subject of an address by Dr. J. C. Bridge, the Senior Medical Inspector of Factories, at a meeting organised by the London Industrial Committee of the National "Safety First" Association held at the Institution of Civil Engineers last week under the chairmanship of Mr. A. Ronca. Dr. Bridge in referring to silicosis, remarked that the late Sir Thomas Legge used to say that until the employer had done everything in his power to prevent disease, the workman could do next to nothing to protect himself. Personally, he did not support that view. "Safety First" principles must be instilled into the workers, and the use of respirators would be a substantial safeguard against the contraction of silicosis. The difficulty was to find a respirator that was suitable and efficient, and to get the people concerned to wear them.

Dr. Bridge referred to the operation of sand blasting, and said he was glad that it had been found possible to substitute steel grit for the sand, with the result that there was much less dust. He hoped in time that other forms of abrasive material would be discovered, so that the use of sand might be eliminated altogether.

Dermatitis was another industrial disease which was prevalent, but it had been found that this did not occur when the skin was intact. He urged that wearing gloves whenever possible, providing there was no danger of the gloves being caught in the machinery. Another method for the prevention of skin diseases he advocated was the inspection of the hands of the workers from time to time. It was computed that a million and a half workers suffered minor accidents to their hands every year, and one in ever 150 of these became septic. Efficient treatment at the beginning would prevent the majority of these septic cases from occurring. The Utopian ideal was for a person to be physically and mentally fit for his work. One result of the increasing use of machinery in industry and the elimination of the skilled craftsman was a crop of nervous disease. More days were lost from vague forms of illness than from all the recognised industrial diseases put together. Workers became bored and listless. There were more dull tasks than there were dull people fitted for them. In conclusion Dr. Bridge stated that interest in your work makes for industrial good health.

British Trade Prospects in Ecuador

THE British Consul General at Quito reports that there has been no growth in the demand for chemicals in Ecuador but rather a decrease owing to both improved health conditions and the general economic depression. In the circumstances, United Kingdom manufacturers should not expect an increase in their sales unless it can be obtained at the expense of their competitors, namely the United States of America, Germany and France. Ecuador's chemical products are in the greater part supplied by Germany, which has maintained its pre-war supremacy, followed by France and the United States of America. Ecuadorian imports of pharmaceutical specialities are chiefly supplied by France, the United States of America and Germany, in the order named. England and other European countries also export these products to Ecuador but on a considerably smaller scale. During recent years, as the result of intense American propaganda, the United States has largely increased its sales in Ecuador and has succeeded in introducing numerous new pharmaceutical products. Chemicals for industrial purposes, such as dyes, etc. are supplied almost exclusively by Germany and the United States in the order named. The majority of American manufacturers, as well as some German, send their travelling representatives on regular visits to Guayaquil. These representatives not only arrange for their local representation, inspect agencies and study the conditions of the market, but also undertake intense propaganda of their products in addition to making personal calls on the medical profession and druggists with a view to convincing them of the efficiency of their medicines. In the majority of cases such representatives are Spanish or Latin-American, and when not they at all events speak Spanish fluently. It is considered that visits of this

class are indispensable and very little business can possibly be obtained by United Kingdom manufacturers unless they are prepared to fall in with this requirement. This is the more essential in the case of firms desiring to open up trade relations for the first time. If, however, United Kingdom manufacturers find it impossible to send travelling representatives, it might prove convenient to endeavour to interest some of the local commission agents in their representation, so that they may carry out the necessary advertising and distribution of samples.

Most of the wholesale business in drugs and chemicals is handled at Guayaquil, and the large distributors have branches and display rooms in Quito. These distributors supply almost the entire demand in unimportant towns of Ecuador. The chief chemists in Quito, however, order their supplies direct from the manufacturers, except in cases of products for the distribution of which other firms enjoy exclusive rights.

The Harrison Memorial Prize

SOME of the younger members of the chemical profession will be specially interested in an announcement which appears in our advertisement columns this week regarding the Harrison Memorial Prize. In accordance with the Trust Deed governing the Harrison Memorial Fund, the selection committee consisting of the reigning presidents of the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry and the Pharmaceutical Society, will make an award of the Harrison Prize next December. The prize is worth about £150, and is to be awarded to the chemist, either lady or gentleman, being a natural born British subject and not at the time after thirty years of age, who, in the opinion of the members of the selection committee, during the preceding five years has conducted the most meritorious and promising original investigations in any branch of pure or applied chemistry, and has published the results of those investigations in a scientific periodical or periodicals. The award of the prize will be dependent upon there being a candidate of sufficient distinction to warrant such an award.

Full particulars are given in the announcement as to the conditions to be observed in submitting applications for the award. The selection committee is prepared to receive applications, nominations or information as to candidates eligible for the prize. Any such communication must be received by the president of the Chemical Society, Burlington House, Piccadilly, London, W.1, not later than December 1 next.

Atmospheric Pollution

THE Verein Deutscher Chemiker contemplates the formation of an Air Pollution Group to promote the development of chemical methods to combat the dangers of atmospheric impurities in war and peace. Although no particular military significance is attached to the proposed group, its activities will include the study of counter-measures to the gas weapon in warfare. The inaugural meeting will take place in Berlin on October 24, 1932, and lectures will be delivered by Professor Remy on "Gases, Vapours and Mists," Dr. Lepsius on "The Significance of Chemical Science and Technology for Luftschutz and Gasschutz," and Dr. Hoffman on "The Smoke Evil and its Alleviation."

Cheap Steam for Industrial Processes

By F. JOHNSTONE TAYLOR

THERE is a large amount of manufacturing such as brewing, paper-making, dyeing and processes connected with food production, and in the chemical industries generally, which calls for considerable quantities of steam at relatively low pressure. Speaking generally, the actual power requirements of these industries are not large. They can be well met in these days by energy purchased from the power concerns which might normally be cheaper than if it was produced by an engine or turbine, but there still remains the necessity of producing steam and the lower the initial pressure, the more it costs to do so. Very little economy will be gained by producing it at say 200 lb. and reducing it for what is collectively termed process work, but if it is first used for power production and then passed into the heating mains, the combined plant can be economically worked.

This condition might appear to entail nothing more than a steam-driven dynamo working non-condensing and so supplying the essential steam. There may be isolated instances where such a simple plant will serve the purpose quite well, but to obtain the maximum economy from an installation of this class calls for careful planning. In the first place even a small industrial plant should produce its steam at a fair average pressure of 200-250 lb., suitably superheated. The prime mover, whether engine or turbine, should be a modern

more to generate at the higher pressure. This is simply a matter of the well-known properties of steam by which its production at 30 lb. from feed at 60° F. requires 1,136 units per pound, while to raise this steam at 200 lb. only calls for an additional 34 units. If steam at 200 lb. is expanded in an engine or turbine down to 30 lb., it will give up 145 units per pound before reaching this pressure and these heat units, assuming an efficiency of conversion of 65 per cent. will give one kW for every 36 lb. of steam passed out into the heating system.

The Choice of the Prime Mover

According to Burge and Chittenden, who are very well qualified to speak on this subject, a factory calling for 30,000 lb. of steam per hour at 30 lb. pressure will have, if it is produced at 200 lb., energy to the extent of 1,600 kW available before it is reduced. The separate production of steam for power and process work would call for a coal consumption of 4.78 tons while that required for a combined production at the higher pressure only calls for 3.60 tons, showing a direct saving of 24 per cent. in coal consumption. A suitably arranged turbine can effect this saving and an extraction engine of good design is nearly as good. Further facilities for the economical production of power are provided by the

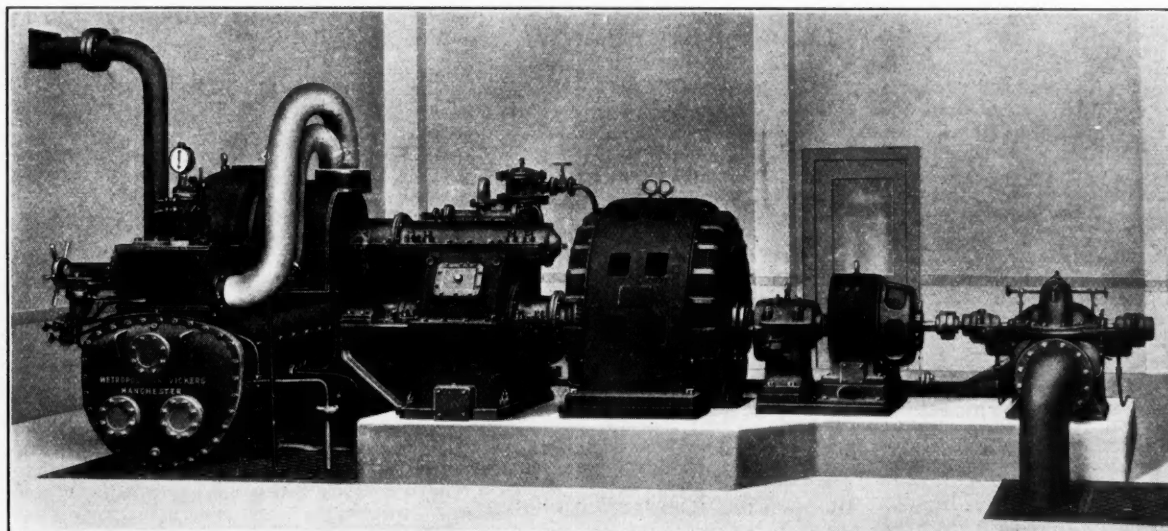


Fig. 1. The Metropolitan-Vickers self-contained Industrial Steam Turbine Set

machine taking about 12 lb. of steam per h.p. hour, but the really important part of the problem lies in the balancing of the power and heating loads so that every pound of steam shall perform the maximum amount of useful work.

Industrial Turbine Plants

Several of the turbine builders, Parsons, Metropolitan-Vickers, Allens, The Brush Co., Daniel Adamsons and others, have recently introduced turbo-generator sets of relatively small power which are very well suited to industrial requirements. Their principal feature lies in building the turbine, condenser, generator, reduction gear, air, circulating and extraction pumps as one compact unit of which the Metro-Vick set shown in Fig. 1 is a typical example. Under the conditions cited the condensing equipment would probably be modified, because, as will become apparent presently, the ideal conditions are those in which all the steam used for power production is usefully employed in the heating mains. The actual conditions there are immaterial, because whether the steam is required at 5 lb. or 50 lb., it can almost invariably be supplied economically through an engine or turbine. Assuming an average pass-out pressure of 30 lb. and a suitable boiler pressure of about 200 lb., it actually costs very little

mixed pressure turbine. This is a combination of a l.p. turbine with a non-condensing one and it can work with steam from two or more sources and it is a useful machine for making good use of surplus exhaust steam whether or not this is stored in a heat accumulator.

It is not necessary, especially under the conditions dealt with, that a turbine set would be definitely a better proposition than an engine, nor might it be essential to scrap a good engine in re-organising a steam plant. The choice of a prime mover is largely dictated by local circumstances. There is no appreciable difficulty in operating the familiar high speed engine of the Belliss class as an extraction engine. Ashworth and Parker, of Bury, make something of a speciality of sets of this type, the engine having a rather large h.p. cylinder fitted with an expansion gear. Between the receiver into which this h.p. cylinder exhausts and the l.p. one is a throttle valve under the dual control of the receiver pressure and the engine governor, the latter being able to over ride the former. The principal part of the equipment is a receiver throttle control valve which balances the demand for heating steam with that required by the engine for power generation on the general lines to be discussed in a moment.

Such sets are relatively inexpensive, but they cannot show

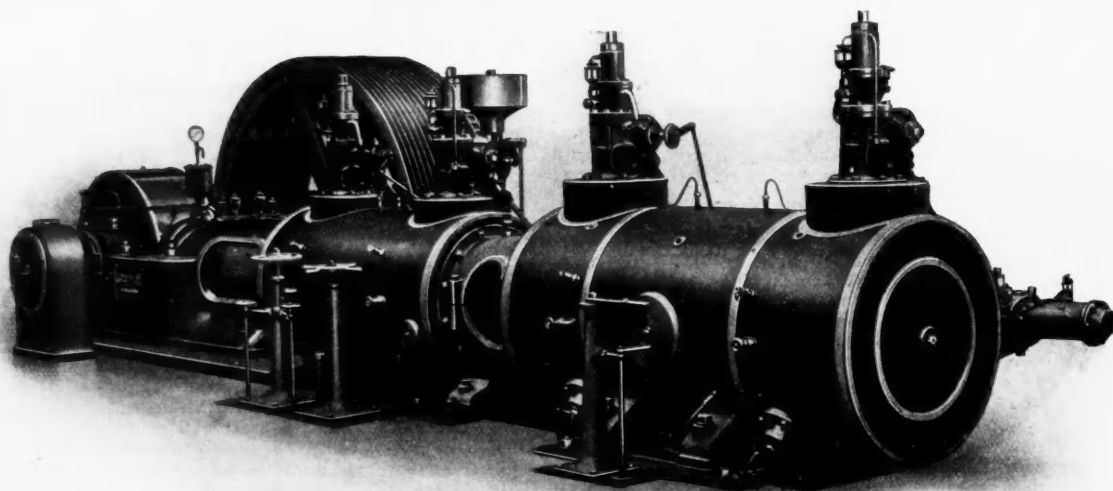


Fig. 2. Tandem Drop Valve Extraction Engine arranged for Rope Drive. (Galloways Ltd.)

quite the economy of the slow speed tandem compound engine built for this duty by such firms as Galloways, Hick Hargreaves, and Sulzers. The Galloway engine shown in Fig. 2 is constructed with a bi-flow h.p. cylinder and a uniflow l.p. one. Equipped usually with a small jet condenser, the ideal conditions of working are realised when the heating system can take all the steam used by the h.p. cylinder. If it takes less, the surplus steam is passed into the l.p. cylinder where, adding power to the engine, it causes the cut-off in the h.p. cylinder to be advanced. Alternatively, if the demand for heating steam exceeds that of the power requirements, the cut-off in the h.p. cylinder is delayed. From the standpoint of power production, it is a very economical system indeed, a contention which can be supported by the following figures relating to an engine with an average output of 300 h.p. taking steam at 150 lb. superheated 150° F., the extraction pressure being 28 lb. and the vacuum 26½ in. When the average demand for heating steam is 3,000 pounds per hour, about 4,750 pounds of steam would pass through the h.p. cylinder, and allowing for losses by drainage in the receiver some 1,750 pounds would pass through the l.p. cylinder to the condenser. For the power developed (275 h.p.) the net steam rate would be 6.3 lb. per i.h.p. per hour. In the case of separate supplies for heating and power, the steam rate of such an engine could hardly be expected to be much under 11 lb. per i.h.p. per hour, of say, 3,025 pounds per hour, which, together with 3,000 pounds of heating steam, would give a total of 6,025 as against 4,750 pounds. This shows a

net saving of 21 per cent., which compares favourably with the estimated saving by means of a turbine.

Balancing the Loads

Apart from suitable steam conditions and installing the most appropriate power unit to meet any specific circumstances the real problem lies in the balancing of the power and heating loads. It is one which calls for considerable skill on the part of the designers of this class of equipment and it cannot be solved by any haphazard arrangements. Briefly it amounts to this. Assuming the prime mover to be compounded it should be so designed that when there is no heating steam in demand it will operate normally as a condensing engine or turbine. On the other hand, when running with the average demand for process steam, this should be supplied by the h.p. stage, the l.p. stage and condenser being virtually idle. If, of course, the power load is at its minimum at the time the heating load is normal it may be necessary to take live steam through a reducing valve which the equipment would automatically provide for. Between these conditions the governor has to adjust the steam distribution. It becomes a relatively costly part of the equipment as a whole, but a saving of even 20 per cent. in the total fuel bill is a handsome profit on the total outlay. The prime mover, in effect, functions as a reducing valve and it is only necessary to provide that wasteful piece of equipment to come into action when the power load is too small to meet the demand for heating steam. While the same conditions apply in the

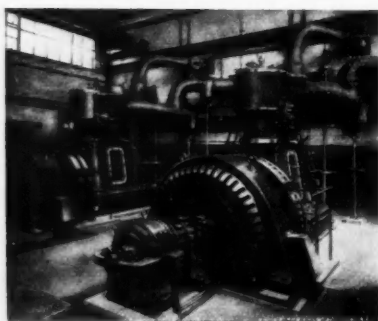


Fig. 3. Power Plant at a Chemical Works, as supplied by Belliss and Morcom Ltd.

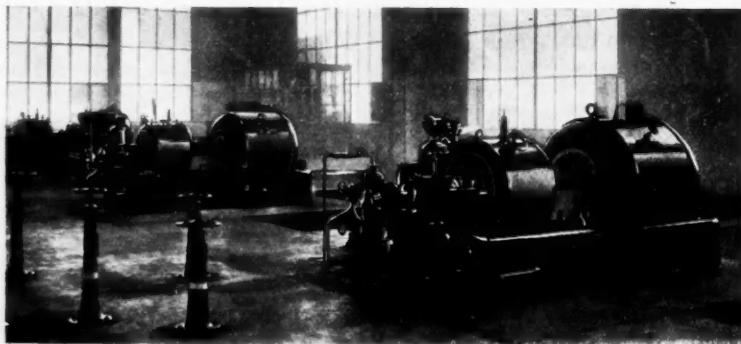


Fig. 4. Three Rateau Back-pressure Turbine-driven "Star" type Compressors, at the Works of the National Nitrogen Co., Toulouse

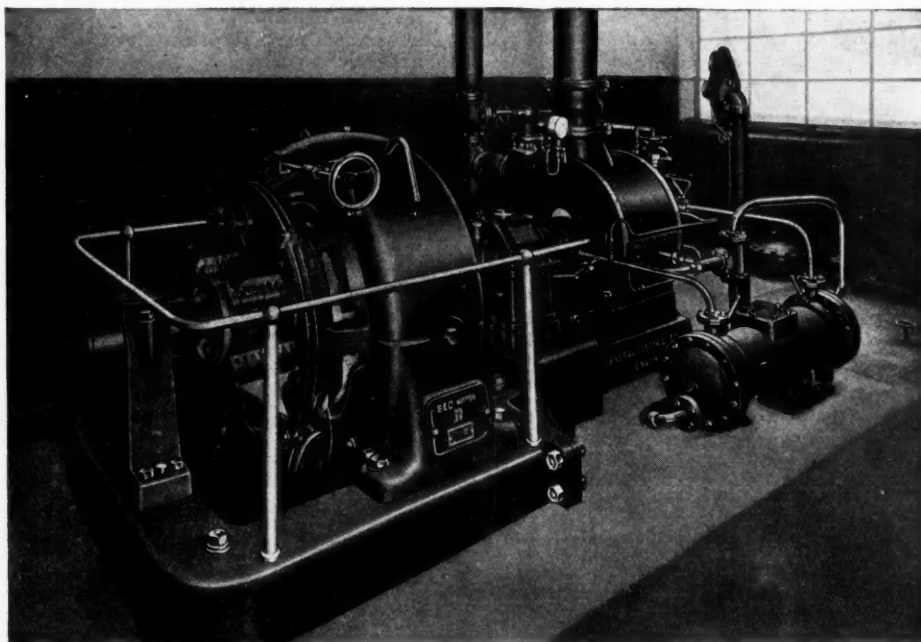


Fig. 5. 100 kW G.E.C.-Fraser & Chalmers Geared Back-pressure D.C. Turbo Generator as installed at a Paper Mill. If the process steam requirements are more than the steam consumption of the turbines when giving the required electrical output the balance of steam required for the process work is supplied through a reducing valve from the live steam mains. If the process steam fluctuates greatly, a pass-out turbine is often necessary. When, however, the steam demand is steady but insufficient for the turbine to develop the full electrical load required, the best arrangement is to proportion the turbine to deal with the full process steam requirements. The electrical output is then somewhat less than the total factory requirements, and the balance of electrical power is bought from an outside supply.

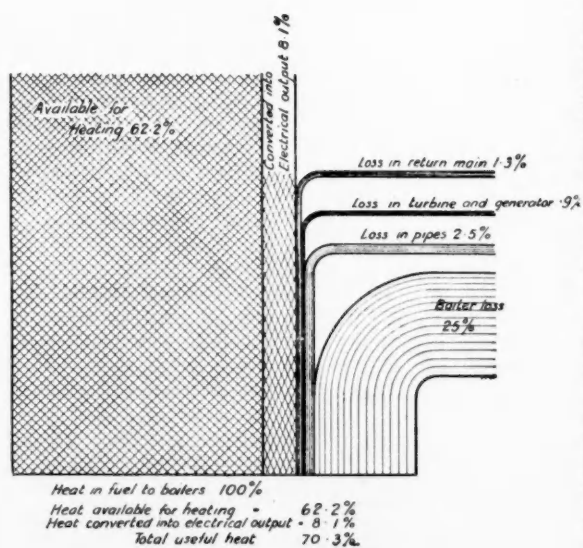


Fig. 6.

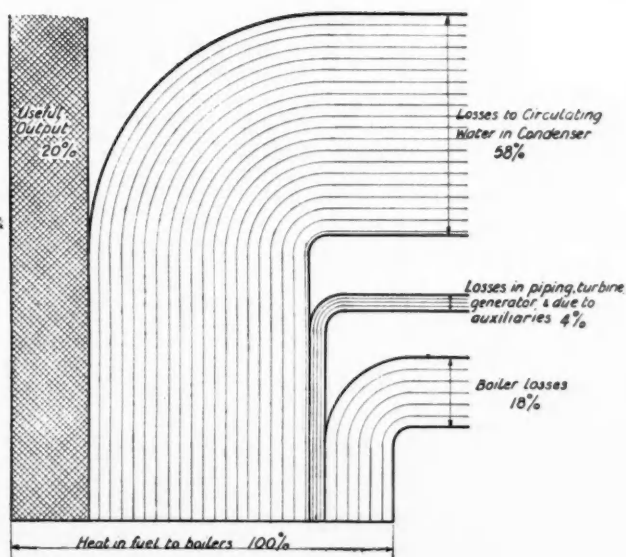


Fig. 7.

A full appreciation of the economies that can be effected by a suitable use of the exhaust steam for process purposes from a back-pressure turbine is best obtained diagrammatically. Fig. 6 shows the heat balance of a factory using process steam and at the same time generating current as a by-product, whilst Fig. 7 shows the heat balance of a modern station working with an overall thermal efficiency of 20 per cent. It will be seen in the latter that the greatest portion of the heat is thrown away in the cooling water, as there is no efficient commercial means of utilising the large amount of heat at low temperatures which this water contains. Comparing Fig. 6 with Fig. 7 it will be seen that whilst the boiler efficiency is less in the factory on account of the smaller size of unit employed and the less economical conditions of working, the overall thermal efficiency is much greater. On the combined heating and power a thermal efficiency of 70.3 per cent. is obtained, as the heat in the exhaust steam is what the plant is primarily installed for and hence full use can be made of it.

main to the operation of a turbine, the heat balance of a compound extraction engine illustrates the economy of the system as a whole (Fig. 8). Here the total hourly quantity of steam Dt may be considered as divided into two parts, D representing the amount extracted per hour from the receiver and d that

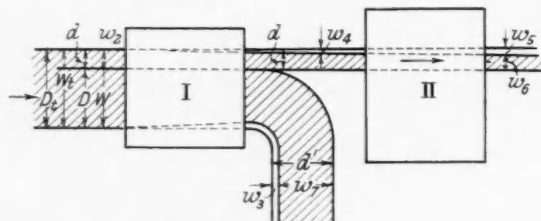


Fig. 8. Heat Balance Diagram for Compound Extraction Engine

which passes into the l.p. cylinder and to the condenser. In the case of D the power developed corresponds to an amount in heat $H'3$ which averages about 10 per cent. of the heat introduced into the engine. The second part d of the total

amount of steam admitted is that which is not abstracted but passes from the h.p. to the l.p. cylinder and is condensed after having done its work in both cylinders. The amount of heat thus converted into mechanical work represented by $H'5$ is thus comparatively small being on an average about 20 per cent. of $H'2$ and the amount of heat lost in the condenser as already suggested is relatively large as represented by $H'6$. It will therefore be obvious that the thermal efficiency of the engine will increase with the amount of steam extracted until, with but drifting steam passing into the l.p. cylinder, the economy of the back pressure engine is approached. To estimate the steam consumption per b.h.p. per hour, one has to deal first with the steam volume d and further with the steam volume which while being raised to admission pressure and temperature would absorb the equivalent of heat used in the h.p. cylinder for power production as represented by $H'3$. With a fairly large extraction, these two quantities only account for a low steam consumption. That portion of the total steam Dt which supplies the heat content of the extracted steam volume must not be debited to the amount of power production and it is not considered when the steam consumption of the engine is being estimated.

Administration and the Art of Management

Essentials of a Sound Promotion System

SPEAKING at a meeting of the Business Research and Management Association in London last week Sir Henry Bunbury, comptroller and accountant general of the General Post Office, said there is a problem, or group of problems, which has been attracting in recent years a good deal of thought and attention in various quarters. It comes up in various forms. Is there a maximum size for industrial combinations beyond which they must fail because they are too large for a single unified direction? What are the true principles of management organisation for very large concerns? Must there be an inevitable shortage of managerial ability as the demand for it grows? Has the war, which took so heavy a toll of the best and most enterprising and most courageous of the generation which would now be in its prime, left an unfillable gap? What are the best ways of educating and training men for management in industry?

Building up an Organisation

He was speaking not of management in its more technical sense—what is commonly known as scientific management—but in a wider sense—the art of building up and maintaining in efficient performance a large organisation of human beings. This is a job at which governmental institutions such as armies and Government departments have been busy for a considerable time, and although the conditions, the purposes and objectives, differ materially from those of large industrial organisations, the fundamental problems are much the same. In the world of government they were accustomed to classify those problems under the three heads of recruitment, training and promotion. One of the clearest lessons of their experience was that if you want good results you must use good raw material, and the problem is to have a definite plan which will secure that you get it—that is to say a sufficient quantity of it to provide in due course for the future needs of your higher directing and managing organisation. That plan should be related on the one hand to the requirements of the particular business, on the other to our national educational system. The recruitment system should be centralised—if only because a single central recruiting system ensures a much wider field of choice—and it should have definite standards of educational attainment and personality. Haphazard recruiting cannot give satisfactory results, and generally resolves itself into the use of the pressure-gauge as the final test: the selection of the man who has most influence behind him. These principles, rigidly followed, rule out quite a number of recruiting methods which are still common enough.

Having secured the raw material it has to be trained, and training offers some difficult practical problems. The easiest course—and the worst—is to assign a man from the street to

a particular branch or department of the business and to keep him there until he has grown thoroughly specialised, has sunk deep into his groove—especially if he is of the keen and ambitious kind—has become stale and disappointed. To a quite important extent the job makes the man. The ideal is that during the vital first ten years or so of his service, in which his capacities are being made—or marred—he should constantly be confronted with a variety of tasks which he can manage to do—but only by an effort—by doing his very best. Never give the beginner a “soft time.” To secure this is, however, not easy, and that is where the importance of recruiting good raw material in the first instance comes in.

The Probationary Period

It is a good plan to impose a definite period of probation in the first instance during which the probationer's aptitudes and weaknesses can be observed, and at the end of which it can be decided with some confidence for what particular line of activity he is best suited and his future training planned accordingly. Sir Henry put in a plea for allowing some opportunity, wherever it is possible, for a certain amount of theoretical study during the training period. There are many spheres in which this combination of theoretical study with practical work is of the greatest value in training men for managerial positions later on.

But if, judging by experience, recruitment calls for high standards sternly maintained, and training is by no means easy to organise, promotion—the third division of our subject—is the most troublesome job of all. Yet upon the soundness of your promotion system the whole success of your enterprise will depend. This is particularly true in relation to the junior promotion—the advancement of the youngsters who carry the proverbial field-marshal's baton in their knapsacks. The first promotion is important; the later ones should follow almost inevitably.

Sir Henry summed up in the form of a few principles what seemed to him to be the conclusions to be drawn from his experience in this matter. A sound promotion system must (1) rigidly exclude all favouritism, influence and patronage; (2) it must appeal to those affected as giving them all fair-play—rewards must be proportionate to merits and to nothing else; (3) since it depends on human judgment it must eliminate as far as possible the idiosyncrasies of individual judgment; (4) it must hold the balance fairly between the claims of long experience and faithful performance of duty on the one hand, and the recognition of exceptional ability and the promise of higher achievement on the other; and (5) it must be clear about the standards to which it has to work, and be rigid in maintaining them.

Plastics in Modern Industry

The New Plastics Group of the Society of Chemical Industry

THE new Plastics Group of the Society of Chemical Industry was formally inaugurated at a meeting held at the rooms of the Chemical Society, Burlington House, London, on Wednesday, October 12. Dr. E. F. Armstrong, F.R.S., past-president of the society, presided and was supported by Mr. J. Arthur Reavell, chairman of the Chemical Engineering Group. The chairman of the new Plastics Group is Mr. H. V. Potter. A wide range of mouldings was exhibited at the meeting to illustrate the variety of the products which are being made from synthetic moulding materials.

Dr. ARMSTRONG, after expressing congratulations and best wishes to the new group on behalf of the president of the society (Dr. Robert H. Pickard), emphasised the point that it was essential for all chemists in England to work together and become members of one big organisation. The Society of Chemical Industry had done its best to prevent the segregation of chemists with kindred interests, and had made every effort to ensure that, whilst maintaining the group system, the groups should be closely linked with the mother body. The society had been successful in connection with the Chemical Engineering Group and the Food Group, and the third was the Plastics Group, and he regarded this linking together as opposed to segregation, as a happy omen for the future. Dr. Armstrong also emphasised how important it was that chemists should know one another intimately, in the interests of the efficiency of their work, and in this connection he said that whenever he had visited America he was impressed by the advantages possessed by the chemical organisations there, because they were all within one society, and that system offered every opportunity for knowing one another. The officers and council and the older members of the Society of Chemical Industry were delighted that those concerned with the plastics industry had chosen, in their wisdom, to be associated with the mother body, instead of forming a separate association.

Welcome from the Chemical Engineering Group

Mr. J. ARTHUR REAVELL, in welcoming the formation of the new Plastics Group, mentioned not only the successes of the Chemical Engineering Group but also some of the difficulties it had encountered in its early days, and assured the members of the Plastics Group that it would be delighted to be of service to them by helping them to avoid similar difficulties. At first he said there had been a fear that any group system within the society would affect the society's local sections, and indeed, in the early days one or two of the sections had forgotten to ask the Chemical Engineering Group to join in some of their ceremonies. It was found ultimately, however, that the group system was helpful not only to the sections but to the whole society, for it enabled men who were deeply interested in a particular subject to discuss their problems with others interested in that same subject. There had been far more inter-communication through the society by means of the group plus the sections than there could possibly have been by working through the sections alone. The reason was that the sections were territorial whereas the groups were occupational or materialistic. The members of a group were concerned with one subject, whereas the members of a section were concerned with a great many subjects, but both were helpful to each other. He emphasised that the headquarters staff of the Society had always been most helpful to the Chemical Engineering Group in everything it had done. He believed that the plastics industry, in forming this group, was helping to further the great purpose which Dr. Armstrong had at heart, that England should produce a chemical organisation which was second to none throughout the world. By reason of the formation of the group the society would be larger and better equipped for its work, and every man interested in plastics would derive help from his membership of the group. On behalf of the Chemical Engineering Group he extended good wishes, and expressed the hope that the two groups would benefit by arranging joint meetings.

Dr. ARMSTRONG then formally declared the new Plastics Group inaugurated, and he inducted Mr. H. V. Potter into the chair, amid prolonged applause. Mr. Potter expressed his

own appreciation of the honour of being elected to the chair, and assured the society that the group committee would do its very best to make the group and the group system a success.

The Plastics Industry

In the early part of his inaugural address, Mr. Potter emphasised that it was the one desire of the officers of the Plastic Group to avoid any overlapping of activities with other kindred societies and institutions and to work in harmony and close co-operation with all other organisations already in existence representing the industry. Whilst there was no desire to intrude into areas well covered by other organisations, it was the duty of the society to see that its members engaged in the plastic industry had facilities for discussion and intercourse on subjects strictly chemical, and for this reason the Plastics Group was formed. The fundamentals of this new industry were chemical, and the society would be lacking in its duty if it did not cater for the chemical interests involved in it. The industries employing plastic materials, he continued, were some of the oldest in history, but his use of the word "plastics" in connection with the group was concerned more particularly with the variety of new materials which had come before the public during the last 50 years, and which had enjoyed an altogether unprecedented expansion in recent years.

The modern version of plastic materials was found in the whole range of ceramic industries and such other industries as cement, concrete, plaster, glass and, not least of all, road making materials. He did not deal with these inorganic or mineral plastic materials, however, for they were too vast, and numerous other specialised societies covered the study of them; his survey was concerned rather with the field of plastic materials of organic origin and more particularly with the synthetic organic products. Rubber, which was an ideal plastic material, was also already provided for scientifically. He therefore confined his attention to those plastics which had developed of recent date, beginning with celluloid and passing on to other cellulose esters, viscose casein and synthetic resinoid products, discussing briefly their preparation and applications. A recent introduction into the field of plastics was that of the cellulose ether benzyl cellulose, which had been manufactured on the Continent for some time, but did not develop commercially on account of high price. Recently well-known chemical manufacturers in this country had succeeded in producing benzyl cellulose on a commercial basis at a price which made it more attractive to the plastic industry. The material was a thermo-plastic but not a thermo-setting plastic. It could be heated to 180° C. without decomposition, was relatively non-inflammable and had very good water resistance, of the order of 0.1 per cent. after 24 hours immersion in water. It was resistant to caustic soda solution up to about 40 per cent. strength at ordinary temperatures for a reasonable length of time, and had remained unaffected by sulphuric acid, hydrochloric and acetic acids for some weeks. The thermo-plastic properties of benzyl cellulose rendered it suitable for the production of moulding powders which are now available, and the product should find many practical applications.

Future Prospects

Discussing the industry as a whole, he said there were no figures available on the value of the turnover, but it was reasonable to assume that, including the gramophone record industry but excluding road making materials, it represented about £10,000,000 to £15,000,000 per annum, and a production of about 25,000 tons per annum. While the industry was at present small in relation to other industries such as steel, textiles, etc., and represented only a minor section of the chemical industry, the possibilities were extensive. Up to the present a great many of the applications had rested upon uses where, in order to meet the special features of these materials, only slight modifications of design were feasible. The future developments were more likely to follow on the lines of designs and construction being entirely controlled by the properties of the materials themselves. In other words,

plastics had in many cases been adapted to meet existing conditions where they could; the future would depend on design being built round the special properties of plastics and the tendency was in this direction. When plastic materials became cheaper, as unquestionably they would, and natural products such as fine wood finishes, expensive stone, natural gums and resins and other natural products become more expensive, new uses for plastics would arise.

As to raw materials from which the plastics were manufactured, most of those on the market utilised cellulose, the exception being casein. There did not appear to be or likely to be any shortage in the near future of the types of wood or cellulose materials required for their production. From the chemical aspect the production of such materials as formaldehyde was dependent upon synthetic methanol, the supply of which seemed to be unlimited, dependent upon the setting up of sufficient plant and equipment for its manufacture. The supplies of phenol were dependent upon the production of tar and its working up. He understood that the only controlling factor of this material was whether it paid the tar distiller so to control his fractions as to produce the phenol fractions or to sell his tar in other forms. Here again, while coal existed and gas was used (as it was likely to be in increasing quantities) there should be ample available materials for producing the raw products from which the phenolic bodies were manufactured.

Importance of Technical Colloids

Dr. L. A. JORDAN, director of the Research Association of the British Paint, Colour and Varnish Manufacturers, proposing a vote of thanks to Mr. Potter for his inaugural address, said that the formation of the new group was really due to an appreciation of realities, *i.e.*, the importance of technical colloids in industry. The curious thing to him was that it

seemed only during recent years that the chemist had awakened to the fact that nature, or at least organic nature, was always colloidal and was very seldom crystalline. He added that we were in danger of using the word "polymerisation," much in the same way as the word "colloid" had been used in the past—a refuge for anything which was not particularly clear was easily understandable. The reason why Dr. Jordan approved of the group system was that he thought it rational and considered it to provide the only reasonable prospect of obtaining some kind of sensible organisation of our professional activities. He subscribed to this system because he considered it was most likely to fit in easily in the future, when everyone had come to their senses. The new group would in due course be worthy of a place beside its elder brothers. He expressed thanks to Mr. Potter both for what he had done in the past and for what it was hoped he would do in the future, and added that Mr. Potter could be assured of active and earnest support.

Mr. H. TALBOT, seconding the vote of thanks, said that very good reasons had been given for the formation of the group within the ambit of the society, and as to the necessity for the formation of such a group to take care of the more scientific aspect of the plastics industry, which was growing so rapidly. He commented upon the value of the chairman's survey of the industry, and suggested that if a further survey could be given 12 months hence, indicating the magnitude of the industry at that time, we should all have some real appreciation of the rate at which the turnover of the industry was growing, and the rate at which the number of substances which could be called plastics was increasing.

The vote of thanks was carried with acclamation, and the chairman briefly responded. He also took the opportunity to express thanks to Dr. Armstrong and to Mr. Reavell for their valued assistance in connection with the inauguration of the Plastics Group.

Future of Colloidal or Coal-Oil Fuel

Position Reviewed by Professor J. S. S. Brame

THE wide publicity which has been given to the successful trial of coal-oil fuel in the Cunard liner "Scythia" stimulated interest in this method of utilising coal, and its possibilities from the point of view of extending the use of coal in this country. This idea, however, is by no means new, for, as pointed out by Professor J. S. S. Brame in a paper read before the Chemical Engineering Group on October 14th, extensive experiments were carried out in the United States during the later years of the war by Lindon Bates and H. O'Neill, who were afforded considerable assistance by the United States Government.

In 1920 Bates and O'Neill read papers on this subject before the Institute of Petroleum Technologists, making very considerable claims for the advantages to be gained by the use of coal suspensions in oil. Amongst these were, higher calorific value per unit volume; greater combustible efficiency; no modification of usual plant for oil burning; no new type of plant for preparation of the fuel; easy transport in tank cars and through pipe lines. O'Neill supplemented these with the claim that in marine use an increased steaming radius of ships was possible, since colloidal fuel was the most compact fuel known. This has been one of the strongest points urged in favour of colloidal fuel, but on average values the calorific value per cubic foot of fuel oil and of coal, assuming no interspacing, is practically the same. It is impossible, therefore, to concede that the mixture can have a higher calorific value on a volume basis than the separate components.

Methods of Obtaining Stability

The definition of colloidal fuel advanced by Bates is that it is a stable mobile atomizable fuel displaying colloidal characteristics comprising particles of solids, droplets of liquids or minute bubbles of gases or combinations thereof suspended in one or more varieties of liquid hydrocarbons. He claimed that colloidal chemistry was carried into the fuel industry and in fact a new branch of chemistry, that of stable coarse suspensions, has been unfolded as a direct outgrowth

and extension of the colloidal. For such a fuel to be of value, it must possess a reasonable degree of stability for a fair length of time. Prolonged stability may not necessarily be required, but he considered it would be satisfactory for most purposes if ensured for a month or two. The methods of obtaining this stability were (1) to stabilise particles by the use of certain protective substances such as soap solution (a typical substance mentioned being a variety of lime rosin grease); (2) to peptise bituminous coals to a limited but sufficient extent by the addition of suitable quantities of coal distillates, such as tars and middle fractions; (3) by intensive grinding to reduce the coal to particles of colloidal or practically colloidal size.

In a report issued by the Committee of Submarine Defence Association, New York, about the year 1918 it was stated "1 per cent. protective colloid enables 30-40 per cent. coal dust (95 per cent. of which passes 200-mesh sieve) to remain suspended for several months in mineral oil; 20 per cent. tar may also be used, so that the mixture contains less than 50 per cent. mineral oil." As is well known, contact with salts in solution will generally cause coagulation in colloidal suspensions with their rapid precipitation, but it was claimed by Bates that contact with salt water, even with vigorous agitation, did no cause separation of the coal. The earlier experiments in the preparation were carried out in the well-equipped laboratories of the Kodak Co., and the material was tried out in a small gunboat, U.S.S. "Gem," which was placed at the disposal of Bates and his colleagues. As indicating that there was some possibility of separation it was suggested that some form of current producing apparatus might be installed in the storage tanks. One important factor in attaining a suitable stable mixture, will be that of sufficiently fine grinding, and O'Neill stated that suitable size was for 97 per cent. to pass 100-mesh screen and 85 per cent. a 200-mesh screen, sizes in agreement with those usually specified for coal dust firing.

For use on shore it seems unlikely that oil-coal mixtures will be successful in competition with mechanical stoking

and particularly with the use of powdered coal. For marine purposes the competition is not only with oil fuel, but also with coal; many vessels are to-day fitted for burning pulverised coal and some are equipped with mechanical stokers. At present its application is only suggested for steam raising, and it must be remembered that in recent years there has been a very marked increase in the number of ships equipped with compression ignition oil engines, for which this type of fuel is unsuited. The fact that the coal-oil mixture can be stored in the oil bunkers or double bottoms of a ship and handled with the usual pumping plant, if such is provided for oil fuel, gives it a distinct advantage over solid coal in any form.

Exaggerated Ideas

Very exaggerated ideas of what the introduction of coal-oil fuel may mean to the coal trade are current. For use on shore, development is most unlikely; coal, either in lump form or as pulverised coal, has obvious advantages. The extended use of the mixture for the immediate future lies entirely in application for steam raising on board ship. Although Bates foreshadowed the possibilities of using such mixtures in compression-ignition engines of the Diesel type, for the present it can safely be said that this development is many years ahead. In 1930 approximately one million tons of bunker oil were used, and in this would be included a proportion used for internal-combustion engines. Assuming that a similar mixture of 60 parts of oil with 40 parts of coal, such as was used in the "Scythia," was employed, and the mixed fuel entirely replaced bunker oil shipped in this country, the weight of coal to give the calorific value of the replaced oil would be about 600,000 tons. The coal shipped as bunkers in 1930 was 15,600,000 tons, and if the coal-oil mixture totally replaced oil, it would be equivalent only to under 4 per cent. of the bunker coal used, and this bunker coal itself is but 6.5 per cent. of the total coal output. For naval use the quantities would be approximately three-quarters of the above, so that taking the Mercantile Marine and Navy together, and assuming that nothing but coal oil fuel was used, the increased demand for coal would amount to approximately one million tons, a very small increment in our total coal output of about 240,000,000 tons.

It is very unlikely that the oil-coal mixture will be available at these widely distributed centres for some years to come, and it is unlikely also to be shipped in bulk in tankers. Unless the mixture has a guaranteed stability, there is obviously a big risk of deposit in the tanks and pipe systems with the possibility of the blocking of suction. Extra wear and tear of pumps and burners must be expected. Combustion in the immediate vicinity of the burner tube does not appear to be as good as with oil alone, for it is reported in the case of the "Scythia" that the burners required clearing about twice as often with coal-oil fuel.

With oil at an average calorific value of 19,000 B.Th.U. per lb., and at 62s. per ton—the current price for fuel oil—one would get about 57,000 B.Th.U. per penny. With coal at 12,000 B.Th.U. per lb., and at 13s. per ton, there was a yield of about 73,000 B.Th.U. per penny. In a theoretical mixture of 60 per cent. of the oil and 40 per cent. of the coal—which was the mixture used in the "Scythia," the calorific value would be about 16,200 B.Th.U. per lb. Allowing 5s. per ton for preparation of the coal, which worked out at 2s. for the quantity of coal used in each ton of the mixture, there was a yield of about 68,000 B.Th.U. per penny.

Dr. Ormandy's Views

Dr. W. R. ORMANDY pointed out that the particles of coal used in the mixture must obviously be of a size which could be produced by ordinary systems of grinding. To talk about producing "colloidal" coal suggested the use of a colloidal mill, and foreshadowed the possibility of a product which would be sold at shillings per ounce, and which would be used, perhaps, for internal medical purposes. If, however, the coal were ground in the same way as that in which it had to be ground for coal-dust firing, then the particles were not capable of being called "colloidal." They were, from the molecular standpoint, cobs of cole, and had a gravity practically twice that of the oil in which they were suspended. Then some mysterious materials were said to have been used, which was supposed to "peptize" the coal; but

so far as he could see, the word "peptize" could not be used in connection with this coal-oil problem in its real scientific sense. It must be said that the coal particles were suspended in an oil which was not a homogeneous fluid. The viscosity of the oil was influenced tremendously by its previous treatment; in fact, a very large number of crude oils were full of colloids, in the chemical sense, which might play a very big role in holding up the coal particles.

Two oils of very similar viscosity might have quite different internal properties, and coal which was stable in one for a sufficient time for the practical purposes required might be absolutely unstable in the other. Bates had hinted in his paper that he had added tar or tar oils, and that would make a very great difference. When tars containing asphaltic matter were added to a lubricating oil there was a separation of the bituminous or asphaltic bodies which were insoluble in the mixture. Regarding Professor Brame's reference to the financial aspect of the matter he wished to point out that the cost of grinding coal—which had to be dried before it was ground—at the rate of, say, 25 tons per day, amounted to about 7s. 6d. per ton; if about 500 tons were ground per day, the cost would be about 3s. per ton, and that had to be added to the price of the coal.

Dr. W. CULLEN asked whether a stabilising agent was added to the coal-oil fuel to prevent the separation of the coal from the oil. Under ordinary circumstances, as to temperatures in this part of the world he imagined it would be possible to make a colloidal fuel which, even without the addition of a stabiliser, which would remain fairly stable for a voyage between Liverpool and New York, for instance, under conditions in which the storage tanks were replenished regularly. But extreme climatic conditions had to be faced in other parts of the world, and he imagined that under tropical conditions the tendency of the coal to separate out from the oil would be very marked indeed. With regard to Professor Brame's mention of a protective colloid used in America, 1 per cent. of which enabled coal dust to remain suspended for several months in a mineral oil, he said he had suspected that that protective colloid was bentonite.

An Economical Fuel for Industrial Purposes

Mr. P. C. POPE (secretary, Institute of Fuel) urged that the first problem was to determine what was the maximum size of coal particle that could be suspended in any particular grade of oil, either with or without a stabiliser. To say that 95 per cent. must pass a 200-mesh sieve, or 85 per cent. must pass a 100-mesh sieve, was not sufficient. There must be some maximum dimension, and the whole of the coal particles used must be within that maximum dimension limit. Otherwise there was bound to be some separation. He considered that oil-coal mixtures had a very much better chance of commercial success inland than at sea. The cost of oil inland was very much higher than its cost on the coast—and the cost of oil was the governing factor in the commercial success of any of these mixtures. He believed that anyone concerned with the oil industry in this country would be glad to get 62s. per ton for oil on the coast; that was practically double the price at which oil was being sold ex ocean installations. With oil at 30s. or 35s. per ton on the coast to-day—and it was sometimes less—it was quite impossible to contemplate commercially a mixture of oil and coal. But at inland plants, with oil at 60s. to 62s. per ton, and purchased in smaller quantities by the users, he believed the use of oil-coal mixtures would pay. Assuming 62s. per ton for oil and 13s. per ton for coal—the calorific value of the coal would be higher than the 12,000 B.Th.U. per lb. mentioned by Professor Brame, because one would use a decently clean coal—mixing them in equal proportions, as was done in the United States some years ago, and assuming the cost of grinding and mixing to be 10s., the cost was 85s. for two tons of the mixture, or 42s. 6d. per ton. Taking the ratio of calorific values given by Professor Brame—19,000 B.Th.U. per lb. of oil and 16,200 B.Th.U. per lb. of the mixture—one could buy the same amount of heat in the mixture for 50s. as one could buy for 62s. in oil. Anyone using fuel would be very glad indeed to save 12s. per ton. The difference between 57,000 and 68,000 B.Th.U. per penny (representing oil fuel and the mixture respectively) did not appear very much, but the 68,000 B.Th.U. represented an increase of 20 per cent. on the 57,000 B.Th.U.

Letters to the Editor

The Editor welcomes expression of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

The British Industries Fair

SIR,—If the experience of my own firm is any criterion, the rush for space at next February's British Industries Fair, to which the Press is drawing attention, is the most hopeful trade portent of recent weeks. When we first commenced showing at the B.I.F. years ago we were employing somewhere in the neighbourhood of 100 employees: to-day we employ well over 1,000, which I consider is largely due to the help received from this annual event. It has increased our turnover more than six times and each year has been a decided increase over the last. Before we exhibited at the Fair we did not do any export trade worth considering, and now our export represents nearly 30 per cent. of our total turnover; the bulk of introductions having come through the good auspices of the Fair.

The increase in the Fair over all Continental rivals has been extraordinary, and I feel that it reflects great credit on all concerned that in such a short space of time the British Industries Fair should occupy the position of the world's premier national fair which undoubtedly it does to-day. We, here, bring out our lines to have them ready for this season

and it enables us to take out quantity orders for the coming Christmas in the early part of this year, and then bring down our production costs to a minimum through the many advantages of mass production. This undoubtedly has been a very great feature towards the success of this and many other businesses I know.

A big factor in the success of the Fair has undoubtedly been the great interest which the Royal Family have taken in it: manufacturers have been stimulated to put forth their best in the hope of their lines coming under the notice of any of the Royal Family who should happen to visit the Fair, the export market especially having been greatly encouraged through these visits. I cannot close without voicing a great regret on the part of the majority of the exhibitors that the Government has withdrawn the subsidy in connection with advertising this year. Advertising, we are told, is the soul of business, and still the Government does not feel inclined to grant £25,000 to encourage British manufacturers.—Yours faithfully,

EXHIBITOR.

Manchester.

The Structural Origin of Visual Colours

Professor Armstrong's Lecture at Manchester

A LECTURE on "The Structural Origin of Visual Colour" was delivered to the Manchester Section of the Society of Chemical Industry on October 7, by Professor H. E. Armstrong, in the Common Hall of the Manchester College of Technology. Dr. R. H. Pickard, president of the society, was present, and Dr. T. Callan, chairman of the section, presided.

Professor ARMSTRONG said that the first research workers to speculate on the subject of the origin of colour were Schönbein and Faraday. The former worker became interested in the subject through his discovery of ozone in 1840 which had an intense blue as contrasted with the colour of oxygen. He also made investigations with regard to the colours of plants, dahlias in particular. In a letter to Faraday, in October, 1852, Schönbein wrote: "Entertaining the notion that in many, if not all, cases, the colour exhibited by oxy compounds is due to the oxygen contained in them, or, to express myself more definitely, to a peculiarly chemical condition of that body, I have continued by researches on the subject, and have obtained a number of results which I do not hesitate to call highly curious and striking." To this letter Faraday replied two months later: "Your letter quite excites me, and I trust you will establish undeniably your point. It will be a great thing to trace the state of combined oxygen by the colour of its compound; not only because it will show that the oxygen had a special state which could in the compound produce a special result but also because it would, as you say, make optical effects come within the category of scientific appliances and serve the purpose of philosophic induction and means of research, whereas now it is simply a thing to be looked at."

An Advanced Doctrine

This was a fairly advanced doctrine for 1852, but everything that has happened since justified it. In 1868, Graebe also speculated to some extent in the same subject. Graebe did not attempt to correlate colour so much with the structure of quinone as with the unsaturated condition of the oxygen in quinone. This was a matter of great importance, and Graebe had really detected the real issue.

Professor Armstrong stated that soon afterwards he himself began to speculate upon the subject. Others followed, including Professor Hartley and Professor Baly, of Liverpool, who really queered the pitch by throwing the attack upon the invisible regions. Personally, he had always

devoted his attention to visual colour. Visual, or visible, colour was whiteness with something left out in every case. In 1888, stated Professor Armstrong, he brought the subject to the notice of the Chemical Society, when he expressed the conclusion that dyestuffs generally, so far as their constitution was known, were all to be regarded as like quinone in structure. Quinone was a very simple compound, the oxygen atoms being regarded as linked to the benzene by two affinities of each and the benzene as having an unsaturated structure. It did not matter whether it was assumed that the affinities were united in that kind of way, or in some other way, the benzene complex as a whole had definite absorbent effect. His view was that colour was a system which at least had the absorbing elements in it which were present in quinone. When he first brought the subject to general notice there were no coloured hydrocarbons, and it was thought that hydrocarbons could not be coloured, until at last some were discovered of a yellow colour.

The First Dyestuff

It was customarily stated in this country that the first dyestuff was made by Perkin. As a matter of fact, the first dyestuff was not made by Perkin, although Perkin was the first "maker" of dyestuffs. Aniline black was made in very early days, long before Perkin was thought of, as also were rosolic and picric acids. Perkin, as a matter of fact, did not use pure aniline, whereas the workers of earlier times used the pure substance because it was made from indigo, if not from benzene. Perkin's great achievement was not that of a dyestuff but the possibility of the manufacture of dyestuffs. He began to manufacture at the age of 19, and he developed astounding practical ability.

Professor Armstrong then referred to the research work with regard to dyestuffs done by Simpson, Maule and Nicholson, Hoffman, Grace Calvert and Co., Caro, Otto Witt, the Bayer and the Badische Chemical Companies of Germany and others. He illustrated the points of his lecture by means of numerous dyed fabrics and other exhibits.

In the discussion which followed, Professor Armstrong was asked why some dyestuffs were so much brighter than others. He replied that it was very much a question of the material and the state of division.

Mr. C. J. T. Cronshaw proposed, and Dr. T. Callan seconded, a vote of thanks to the lecturer for his paper.

Hydrogenation Cracking of Tar Oils

A Criticism of the Value of the Process and its Products

INTERESTING points were raised in the discussion which followed King and Matthews' paper on "The Treatment of Tar," read before the Institute of Fuel on October 12, and reported in THE CHEMICAL AGE, October 15, page 351.

Dr. R. LESSING said that six or seven years ago we were informed that the I.G. in Germany had started the hydrogenation of coal. It was soon found out that this was brown coal which was much easier to treat than bituminous coal and then a little while later news reached us that what they had proceeded to do in their first endeavours was to hydrogenate brown coal tar, which was certainly much more easy to handle than the solid raw material itself. That led to the hydrogenation of petroleum oils on a very large scale and in America at the present time there were two very big plants operating under the control of the Standard Oil Co., and the I.G. In this country the coal industry itself had not been too ready to avail itself of the very wonderful work that had been done in a comparatively short time by Imperial Chemical Industries, and that work as far as one knew at the moment had not been profited by. The Fuel Research Board at the Fuel Research Station had already done valuable work on the hydrogenation of coal but the work described in the paper seemed to him to be particularly valuable and useful because it afforded a very ready means of attack on what was to-day a drug on the market, viz., a proportion of the production of coal tar in this country.

The Need for Treatment of Coal Slack

The Fuel Research Station before hydrogenation came along had a plant for the extraction of tar oil from tar, with the direct production of pitch, which had not been subjected to any kind of cracking or other decomposition. The work of Professor Morgan, at Teddington, very largely made use of this particular type of treatment as a starting point for his brilliant researches, bearing in mind and having as a leading and guiding idea the avoidance of decomposition in the early stages. Without knowing anything about it but simply using his own impressions he would have thought that tar oil extracted say from petrol or tar with the production of pitch at the same time, would form a more compatible material than distilled oil. If he were correct in assuming that the dissolved tar oils were more easily treated and more profitable treated than the distilled ones, we should have to contemplate the treatment of raw tar by a solvent method obtaining on the one hand an undecomposed oil and, on the other hand, an oil which could go to the hydrogenation process to be treated—and it could easily be treated—for the production of motor spirit and fuel oil if not lubricating oil. There was in this country an enormous quantity of coal slack and duff which was sold to-day, to the detriment of the average coal price, at a very considerable loss and which was largely responsible for the difficult economic state of the coal industry. If, on the other hand, it was possible to briquette this and, possibly, prepare some motor fuel from it by subsequent carbonisation—which would be very much easier than the carbonisation of the slack itself—then we should be helping not only the tar industry but, even still more important, the coal industry and, in addition, it made possible the hydrogenation of this immense product of tar oil in place of its distillation and dependence on a number of markets for its success.

Creosote Oil versus Fuel Oil

Dr. W. R. ORMANDY said the paper was distinctly different from the majority of the papers that had been read on the subject of hydrogenation in that it contained statements of fact wherefrom it was possible to form an opinion to which some weight could be attached. One point in which he was not in agreement with the authors was where they encouraged the suggestion that tar distillates were, or might be, suitable for Diesel engines of the slow speed variety and presumably possibly for those running at high speeds. It was stated that creosote oil resembled fuel oil in its specific gravity, its viscosity, its lack of water and absence of ash, but it might be pointed out that castor oil and cod liver oil were very much alike as regards specific gravity, colour, lack of ash

and absence of water, but one of them contained a little bit of something which the other had not got! In the same way, creosote oil contained a little bit of something which the other had not got. In the first place it had a less heat value and a high spontaneous ignition temperature. It also had a greater time lag and to get a really good smooth running engine it was necessary to design it for a compression higher than the minimum compression at which the fuel with which it was supplied would work. The compression necessary with creosote oil was considerably higher to get ignition and smooth running over a wide range of load and he hardly thought this was likely to be accepted unless the price ratio was very different from what it was to-day. The point that enabled one to judge whether an oil would run sweetly in a Diesel engine was the degree of cracking brought about at the lowest possible temperature. Those oils which cracked readily were oils which were good for the Diesel engine but unfortunately they were also the type of oil which the gas industry liked because they were the best oils for cracking and giving maximum B.Th.U.'s in the form of gas for enriching water gas.

A New Plant at the Fuel Research Station

Captain FRASER SHAW (Fuel Research Board) said that at the Fuel Research Station preparations were being made to install a larger plant than that used hitherto. Dr. Lessing had mentioned that the subject was of great importance and apparently the Government a short time ago also considered it to be of great importance because the expenditure of a fairly large sum was authorised for speeding up the work on this problem. As a consequence the staff at the station were attempting to arrange a plant capable of dealing with about two tons of low temperature tar per day. This would enable the staff to work under any conditions that were required and it would also have the advantage of enabling the work to be demonstrated on a large scale. It had been the experience at the Fuel Research Station that demonstrations on a real working scale were much more appreciated by inquirers than any amount of work done on a very small scale, such as had been described in the paper. The Government were alive to that point and had instructed the director of fuel research to arrange for the erection of a plant in the near future for dealing with from 1 to 2 tons of low temperature per day.

Utilisation of High-Boiling Coal Tar Products

Mr. H. HOLLINGS (Gas Light and Coke Co.) said that although Dr. Ormandy had stated in some detail the various disadvantages of coal tar products in internal combustion engines he was sure he himself would not be expected, in the presence of so many of his friends in the gas industry, to be drawn into any sort of admission of agreement with what Dr. Ormandy had said. Perhaps he might suggest the moral of what had been said about the disabilities of coal tar products in the Diesel engine. If the spark ignition engine was considered, then the position was quite different. Benzol was competing with petrol to-day and selling at a higher price. Experiments had shown that if an oil of higher boiling point, such as creosote, was suitably pre-heated before admission to the cylinder, it could also be used in the spark ignition engine and he felt it was clear that it must possess the same advantages over the petroleum product of corresponding boiling point that benzol possesses over petrol. Therefore, he suggested that those whose business it was to interest themselves in the development of home produced oils for transport should really concentrate all their research activities upon the development of suitable appliances for the use of the higher boiling point coal tar products in the spark ignition engine. It seemed to him that in this field coal tar products having a ring structure rather than an open chain structure had an undoubted advantage over any petroleum product having a corresponding boiling point. With regard to the so-called Diesel oil resulting from hydrogenation, the experience of the Gas Light and Coke Co. was that the spontaneous ignition temperature of the high boiling point hydro-

generation product is higher than that of a good Diesel oil. It was certainly lower than that of an unhydrogenated oil but it was still higher than that of what was accepted as a good Diesel oil to-day.

Coal Treatment in the Melting Pot

Mr. JOHN L. STREYENS (National Oil and Coke, Ltd., Ottawa) in a written contribution to the discussion, said it is unfortunate that hydrogenation costs are not yet known, although they must necessarily be high. Initiating a large scale tar hydrogenation industry presumably at a centralised plant drawing its supplies from all parts, offered insuperable difficulties. The question of producing satisfactory Diesel engine oils from coal products with spontaneous ignition temperatures comparable with those from petroleum and shale oils, was by no means solved economically although by doping with organic nitrogen products a certain amount of success had been achieved. Mixing with petroleum oils was not entirely satisfactory but interesting data was being accumulated on the effect of the addition of small quantities of powdered coal to all sorts of oils that ignite with difficulty in the high speed engine, and "topped" coal oil distillates had been found to have lower spontaneous ignition temperatures than the straight run material. Whilst to-day more was known about coal products and what to do with them than ever before, world economic conditions were dead against their extended utilisation. Even if liquid products from coal, equal in value to petroleum oils for special purposes, were forthcoming, the possibilities of their displacing, or even partly displacing, present sources of supply were hopeless under existing conditions. This applied more particularly to gas oils, fuel oils, Diesel oils and "cracked" benzenes, even allowing for tax preferences on home produced material. Carbonisation and other oil-from-coal industries must stand or fall on the returns from the solid residues, very little benefit accruing from treatment of the liquid portion over and above what is directly obtainable by sacrificing the distillate in its raw state. The whole question of coal and treatment in this country was at present in the melting pot and undue optimism as to the

future prospects in any branch of the industry was far from warranted.

Mr. MATTHEWS, in reply, said that experiments had been carried out on the hydrogenation cracking of tar oils obtained really in the manner suggested by Dr. Lessing, *viz.*, by the precipitation of pitch with light petroleum, but unfortunately for Dr. Lessing's supposition it had been found that tar oils extracted in that way hydrogenated about the same quantity of tar oils as was obtained by the distillation of the same tar. On the other hand, pitch after distillation was very intractable to hydrogenation whereas the pitch precipitated by light petroleum gave a very good starting off material for hydrogenation cracking purposes. He was rather sorry in a way that there had been so much criticism of the use of creosote and tar oils generally in Diesel engines. It was true, as Mr. Hollings had said, that the spontaneous ignition temperature of Diesel oil from an hydrogenation cracked product was higher than in the case of a petroleum gas oil but it was half way between the petroleum product and the original tar product so that the hydrogenation cracking treatment had improved it as far as the Diesel oil fuel was concerned with spontaneous ignition temperature. In a way that was to be expected because in the tar oil there were a large number of aromatic compounds having a condensed ring system, such as naphthalene and anthracene, and by the study of the behaviour of various pure compounds under similar conditions to those which the tar was subjected to, it had been found that the rings broke down with the formation of compounds having side chains, and, as Dr. Ormandy had pointed out, one essential of a good Diesel oil was that the material should crack and produce gas fairly rapidly in the engine. The aromatic compounds having side chains with more than one carbon atom had a tendency to crack moderately rapidly and to produce, at any rate, a small amount of gas which might be all that was necessary to start combustion in a Diesel engine. There was quite a promising line of work in that direction and he did not like people generally to throw cold water on what might turn out to be quite a promising line of research.

Heat-Resisting Metals in the Ceramic Industry

By J. FERDINAND KAYSER

The following extracts are taken from a paper read before the Building Materials Section of the Ceramic Society, at their meeting in London, during September. The author is chief metallurgist to Darwins, Ltd.

THE conditions under which heat-resisting alloys are required to work vary to an enormous extent, not only in regard to temperature but also in regard to the atmospheric conditions and the stress to which they are subjected. In order to be able to judge whether or not a heat-resisting metal may be economically applied for any particular purpose and, if so, to choose the best possible metal for that purpose, it is therefore necessary thoroughly to appreciate the nature of the conditions under which the metal will have to work, the properties of metals at high temperatures in general, and the properties of the available heat-resisting metals in particular.

Surface Stability

The most essential characteristic of a heat-resisting metal is surface stability at high temperatures. Fortunately, surface stability is attainable comparatively easily, and the stability of metal surfaces can be tested with equal facility. It is not proposed to enter into a long discussion of what constitutes oxidation or scaling; it is considered that an alloy resists such action if at the particular temperature at which it is tested, the cross-section of unaltered metal is not appreciably affected, and if corners of machined or ground samples maintain their original sharpness. It is not necessary that the surface of the metal remain bright and untarnished. One might expect that with increase in temperature the rate of oxidation would gradually increase, but fortunately that is not the case. There is a certain critical temperature below which the rate of oxidation is so low as to be inappreciable, and it is that temperature to which the author refers as "scaling temperature." The time factor must, of course, be considered to some extent, but it has been definitely established that if an alloy will resist oxidation as defined above

for not less than 12 hours, then for all practical purposes the metal may be said to have a stable surface at the temperature in question.

The author's tests are carried out in an automatically controlled electric furnace, and consists in maintaining suitable samples for 18 hours at 700° C. and then removing them from the furnace and examining their surfaces. Samples showing no signs of scale are returned and maintained at 750° C. for a further 18 hours and again examined. The test is continued until ultimately a temperature is found at which scaling has set in and the scaling temperature is then reported as being between that particular temperature and a temperature 50° lower, *i.e.*, an alloy which does not show signs of scaling at 1,200° C., but does show signs of scaling at 1,250° C., is reported as having a scaling temperature lying between 1,200° C. and 1,250° C. Even mild steel has a reasonably well-defined scaling temperature, but as the resistance of the metal is increased by suitable change of composition, the scaling temperature becomes more sharply defined.

Effect of Reducing Atmosphere

Dr. Hatfield's nickel-chromium steel, containing 8 per cent. nickel and 18 per cent. chromium, is essentially a stainless steel, and its real field of use is at temperatures below 700° C. It has, however, considerable resistance to oxidation at high temperatures and is used to some extent for heat-resisting purposes. An oxidising atmosphere is not, however, the most dangerous. Reducing atmospheres containing sulphur dioxide or sulphuretted hydrogen are the most dangerous atmospheres with which heat-resisting alloys have to contend. It has not yet been established what is the permissible percentage of sulphur dioxide or sulphuretted

hydrogen that the different alloys can withstand, but it is known that when the sulphur content of the original fuel exceeds some 1.5 to 2 per cent. the life of alloys containing more than about 25 per cent. nickel, is very seriously shortened, whereas nickel-free heat-resisting alloys are completely immune from attack. Nickel alloys which have been attacked by sulphur fumes are always covered with a brittle scale which frequently shows sign of having been molten, although the furnace temperature may not have exceeded 900° C., and on occasion buttons of the scale have been found on furnace floors.

All nickel alloys, except those containing aluminium, are liable to sulphur attack. In general the higher the nickel the greater the probability that sulphur attack will commence, but different casts of the same composition do not always behave the same when tested side by side in a sulphurous atmosphere. Oxidation or scaling in air always commences at a definite temperature depending upon the composition of the alloy, but there is no definite scaling temperature in sulphurous atmospheres and failure is likely to occur at any temperature above 700° C. if the concentration of sulphur is sufficiently high.

Time Factor in High Temperature Test

The extent to which time enters into high-temperature tests was not thoroughly appreciated until the publication of Dickinson's paper to the Iron and Steel Institute in 1922 ("J. Iron and Steel Inst., 1922, 106, 103). Since that time a new technique in mechanical testing at high temperatures has been developed, but in spite of the large amount of work that has been done, the real nature of the physical properties of metals at high temperatures is not yet properly understood. It is, in fact, doubtful if the real nature of the tensile properties of metals at ordinary temperatures was appreciated until the publication of Dickinson's aforementioned paper. The phenomena encountered in testing a sample of very hard steel are, comparatively speaking, simple. The test-piece will ultimately rupture without appreciable change of dimensions and the elastic limit and the maximum stress coincide. In the case of a ductile metal the phenomena encountered are, however, rather more complex. When the yield point has been definitely passed any increase in stress causes a reduction in area of the test-piece and the stress per unit area necessarily increases at a greater rate than the increase in actual load. If there were no such thing as strain hardening it is obvious that the test-piece would continue to elongate at an increasing rate until rupture occurred.

At normal temperatures, however, practically all known metals do strain-harden or work-harden to a considerable extent, and in the case of a ductile metal there is a considerable range between the yield point and the maximum stress in which stability of dimensions may be attained. As the temperature increases the properties of metals gradually change until ultimately a point is reached where, if the stress is sufficiently high, the sample elongates with increasing rapidity until fracture ultimately occurs.

A Survey of Working Conditions

Before heat-resisting metals can be applied with confidence, in the same way that alloy steels can be applied to, say, automobile design, an answer must be given to the question: "What is the maximum load that a given alloy can sustain at any given elevated temperature over a long period without change of dimensions?" The term "long period" may be variously defined as being from one year to, say, fifteen years, and the critical load per unit area which will just not appreciably strain a sample of the alloy when allowed to remain for a long period is variously referred to as "limiting creep stress," "limit of viscosity," "creep limit," etc. If an indefinite supply of apparatus is available and one can afford to wait the results of actually stressing samples for a period of years, the subject does not present much difficulty. Heat-resisting alloys are, however, already being used regularly and the demand for them is growing; consequently, some method of test is required which will enable one to determine the "safe-load-temperature" curve for an alloy in a reasonable length of time, say, two months.

It is most necessary not to lose sight of the fact that heat-resisting metals, in common with the majority of other metals, have a definite coefficient of linear expansion, and when designing plant, provision must be made for it. The

actual values for the coefficient of expansion vary according to the particular composition, but it is a safe rule to assume that it is not less than 0.00002. If one assumes that in use the metal will be heated to 1,000° C., provision must be made for a total linear expansion of 2 per cent., which in a structure 10 feet long is 2.4 inches. The combined effect of thermal expansion and contraction, assisted in many cases by oxidation, leads to the total disintegration of some alloys. Alloys with a high carbon content are usually brittle and uneven heating will frequently cause them to crack in use. In the case of some of the cast-irons the increase in temperature takes place and castings will grow enormously without being stressed. It is also necessary not to lose sight of the fact that prolonged retention at high temperatures or slow cooling may give rise to changes of structure which render the material exceedingly brittle.

Thermal Resistance

In judging the importance of thermal conductivity data on metals to be used in the construction of any particular installation in which the transfer of heat is involved, Van Dusen (Symposium on the Effect of Temperature on the Properties of Metals, A.S.M.E. and A.S.T.M., June, 1931.) has shown that the entire thermal path must be considered as a whole. It is useless to reason offhand that a metal of high conductivity should be used to increase the heat transfer, or that a metal of low conductivity should be used to decrease heat transfer. The chances are that the possible increases or decreases so obtained will be insignificant except in very special cases. As an example, Van Dusen mentions the simplest and most extreme case in which there is a heat flow from gas on one side of a metal sheet to gas on the other. Under any condition met with in practice, the thermal resistance of the sheet, regardless of the kind of metal of which it is composed, is utterly insignificant compared with that between the metal surface and the ambient gas on the two sides. While the gas on one side may be many degrees hotter than that on the other, the temperature drop through the metal itself will be only a small fraction of a degree. The attempt to increase the heat transfer by an appreciable amount by using a metal of high conductivity is obviously futile. As a matter of fact, it so happens that the heat transfer might be materially reduced by using a metal sheet composed of silver, the best conducting metals known.

The majority of heat-resisting metals are essentially alloys of nickel and/or chromium and iron. They also contain various small percentages of carbon, tungsten, copper, molybdenum, etc. In the presence of sulphur the resistance to attack is more or less inversely proportional to the amount of nickel present, and the greatest resistance is exhibited by nickel-free alloys containing approximately 28 per cent. of chromium. The addition of aluminium to a nickel-chromium alloy considerably increases its resistance to sulphur attack, but it is then difficult, and consequently expensive, to produce. It is interesting to note, however, that if nickel-chromium alloys are treated with aluminium they become completely resistant to sulphur attack. Carbon does not affect the resistance to scaling to an appreciable extent, but does lower the melting-point. Tungsten slightly increases the resistance to sulphur attack, but it has no appreciable effect upon the resistance to scaling in oxidising atmospheres free from sulphur. One per cent. of carbon may be present in alloys which are only required in the form of castings, but if rolled sections are required the carbon must be reduced. It should not, however, be less than 0.3 per cent. if the alloys are required for a part that has to withstand stress. Increase of the carbon content renders the alloys more brittle and more liable to crack due to uneven heating.

Cast-irons containing silicon are exceedingly brittle and are not suitable for use at temperatures over 700° C., as they have no appreciable strength in tension. The use of a cast-iron containing more than 12 per cent. nickel can never be economically justified, as an iron-chromium alloy containing approximately 28 per cent. of chromium is much cheaper and at the same time in every way superior. At temperatures below 700° C. there is probably a considerable future for cast-iron containing small percentages of nickel and chromium, but the suggestion that any heat-resisting cast-iron ranks with nickel-chromium alloys for heat-resisting properties cannot be substantiated.

Chemical Problems in the Leather Industry

Leather Trade Chemists meet in London

A MEETING of the British Section of the International Society of Leather Trade Chemists was held on October 6 at the Shoe and Leather Fair, Agricultural Hall, London, Mr. F. C. Thompson, president, being in the chair. The meeting was well attended, and amongst visitors present were M. Vourloud, president of the French Section and Mr. Gosta Ehrnberg, of Scandinavia. At the conclusion of routine business, a report from Mr. A. B. Craven on the British Standards Institution was read by the president, in which the progress made since the March meeting of the section was outlined.

The PRESIDENT referred to the progress which had been made in connection with the forthcoming Symposium in Protein Equilibria. It would immediately follow the annual general meeting of the British Leather Manufacturers' Research Association, and to be held at the Leathersellers Hall, St. Helen's Place, E.C.3. The date had not yet been fixed, but it would most probably be Friday, December 2. Professor Donnan had given his support to the project and would read the introductory paper. Contributions had been promised also from Dr. Speakman, of the Textile Department, Leeds University, Dr. Dorothy Jordan Lloyd, Mr. R. H. Marriott, Mr. Atkin, Mr. F. C. Thompson, Dr. G. H. Spiers and others. Further details would be published later.

Mr. J. A. HALL stated that the report of the committee on the detection of phenylene diamines in leather was not sufficiently completed to be presented. The chief point upon which work was proceeding was to settle whether phenylene diamines could be satisfactorily detected in the presence of tannins. It was thought that a suitable method had been found, but further experimental work was being done, and upon which a report would be issued in due course.

Cause and Prevention of Red Heat

Dr. MADGE E. ROBERTSON then read a paper on "Red Heat: Its Causes and Prevention." The extensive red colourations known as "red heat," that sometimes appeared on salted hides have been found to be due, for the most part, if not entirely, to the development of red coloured organisms of the group known as halophils or salt-loving bacteria, which are found in marine curing salts, and require a high salt concentration for their multiplication. Hides reddened by this growth tended to putrefy more rapidly than hides not so affected and where red growth had been extensive and of long duration, damage to the grain tissue may be caused by the organisms. Experiments were described on the cultivation of bacteria from commercial marine salts, which later were found to produce red stains on hide similar to those on ordinary "red heat" infected hides.

Tests have been made with a number of disinfectant substances—sodium bisulphate, sodium bisulphite, sodium carbonate, borax, boric acid, naphthalene, sodium silico-fluoride and sodium fluoride, with the object of finding one that would check the growth of halophilic organisms when added in small quantities to curing salt and would not damage the hide. Sodium silico-fluoride and sodium fluoride have given the most satisfactory results. Added to curing salt in a proportion of 0.5-1 per cent. on the weight of salt, either of the substances checked growth and left the hide in good condition. Several large scale experiments with hides and calf skins cured by the fluoride method in New Zealand and tanned in this country have given satisfactory results both as regards prevention of "red heat" and the quality of leather produced.

During the discussion, Mr. MARRIOTT remarked that sodium fluoride gave no staining, and the leather came out well, particularly so in the case of sole leather.

Professor MCCANDLISH made the observation that some 20 years ago, 4-5 per cent. of soda was added to the salt used for curing of calf skins. This was satisfactory for the repression of "red heat" as well as the blue and green forms of stain. Incidentally a good soft calf leather was produced.

Mr. H. BRADLEY, director of the Boot, Shoe and Allied Trades Research Association, being unable to attend, Dr. R. S. Edwards read his communication on "Recent Work of

the Boot, Shoe and Allied Trades Research Association." This paper dealt with several points, and stressed the importance of studying leather statistically and especially the aid which statistical science could give in the difficult problems presented by leather sampling for the estimation of the merits of a batch. Both in connection with laboratory researches and in commerce, statistical science provided a potent implement. A sampling formula was discussed and the method of its use described. The association's work on the physical properties of leather was referred to and the value of accurate density measurements in association with chemical and physical analysis discussed.

The next paper was by Dr. J. Gordon Parker on "Notes on Wear Resistance of Sole Leather." A description of the Thuau machine was given, and a number of curves exhibited showing the wear resistance of several types of leather and the effects of particular treatments of wear resistance. It was shown that bleaching did not improve wearing qualities, but had an adverse effect, while cutting down the time of tanning also resulted in a leather of decreased wear resistance.

Heating Effects on Leather

The last paper was given by C. H. Spiers on "The Expansion and Contraction of Leather on Heating." The effect of temperature on leather is of importance in connection with area measurements, foot comfort, tension in belting and the covering of such articles as cameras with leather. Rise of temperature under such conditions that the moisture content of the leather remains constant appears to cause a very slight expansion; for absolutely dry leathers, a rise of temperature from 0° to 60° C. causes a reversible linear expansion of about 0.16 per cent. in the case of box calf and of 0.2 per cent. in the case of vegetable calf. Above 75° C. there appears to be a slight irreversible contraction. Normally rise of temperature will most likely be accompanied by loss of water, which causes considerable contraction. The net effect of rise of temperature under these conditions is therefore a marked contraction.

The meeting closed with a vote of thanks to Mr. Thompson for presiding and to the management of the Shoe and Leather Fair for the use of the meeting room.

Isolation of Rarer Metals

Application of the Thermal Dissociation Process

ALTHOUGH processes for the production of metals by thermal decomposition of their compounds have been known for many years (the manufacture of very pure nickel from nickel carbonyl being one particular case) special attention may be directed to the recent researches of van Arkel ("Rev. Universelle des Mines," 1932, 75, No. 8, 37) who has applied the method to the rarer metals, including tungsten, zirconium, titanium and vanadium. Pure tungsten can be obtained by decomposition of the hexachloride, the latter being formed in the first place by reaction between chlorine and tungsten vapour at a comparatively low temperature. Subsequently exposure to a higher temperature (1,500° C.) results in precipitation of the metal itself. In the case of zirconium, titanium, thorium and hafnium the iodides are used in place of chlorides. Valuable work has also been carried out in relation to the preparation of iron of the highest purity by thermal resolution of iron iodide.

Another interesting development is the manufacture of boron in an extremely pure form by the high temperature treatment of boron tribromide vapour in presence of a tungsten filament and mercury, the latter functioning as a reducing agent ("Metallbörse," October 5, 1932, 1,279). Remarkable properties are exhibited by the pure element which is capable of cutting glass and undergoes the most extraordinary change in electrical properties with rising temperature. Although possessing an electrical conductivity not much greater than zero at room temperature, it undergoes a million-fold increase in conducting power when heated to 1,000° C.

Complexity in Metallurgy

An Over-Production of Alloys

THE Birmingham Metallurgical Society entered upon its thirtieth season of activities on October 6, when the new president, Mr. A. A. Jude, delivered an address on matters of a general nature connected with metallurgy. Founded in 1903 by a small band of enthusiasts, the society has grown in size and scope and exerts an important influence on the technical life of the Midlands. Not only does it cater for the needs of those engaged in the many branches of the metal-producing trades which are centred in this district, but it endeavours to serve the innumerable users of metals in the engineering and allied trades of the city by keeping them in touch with new things as they come along. Co-ordination with other societies in the district which have a restricted ambit enables the whole metallurgical field to be surveyed with a united front.

Rationalisation as a Fallacy

It may be mentioned that several years ago the first lectures on magnesium castings and on the nitride process of case hardening steel to be given in this country were organised by the society; and the coming session includes a lecture on the welding of copper, which was, until recently, considered a difficult feat. In addition, the society maintains a constant interest in the allied subjects of fuels, furnaces and refractory materials; and, to encourage the younger metallurgists, a prize and medal are offered each year to the technical college student presenting the best essay on a subject within the scope of the society.

Mr. W. F. Bragener, last session's president, was in the chair, and presented the society's medals and books to R. J. Brown, for his paper on "The Microscope in Automobile Engine Production."

In opening his address the new president, Mr. A. A. Jude, remarked that the relative inaccessibility of literature on some subjects led to things being thought out and worked out by people for themselves. This was called undesirable, and was sometimes deplored as undesirable. He did not agree in the least. The principle of rationalisation in the current industrial sense was an utter fallacy, and was proving itself so with a vengeance. With the present constitution of society, good or evil as it might be, the machine "did not work." The vast volume of technical literature was a reflex of the vast and growing complexity of things. What most people refused to recognise was that complexity was not necessarily an indication of rising efficiency—using the word "efficiency" in precisely the way one used it in connection with machinery or business affairs.

The Quest for the Ideal Metal

In metallurgy an enormous complexity was being fostered. Alloys were simply being spawned—nine out of ten which were as like as two peas from the point of view of utility. Throughout it all, there seemed, nevertheless, a more or less unconscious struggle to produce an ideal metal. Such an engineering metal must be able to fill the following bill—cast easily and surely, forge easily and surely, rub on another piece of it without giving trouble, have a negligible coefficient of expansion with heat, must be easily machineable, must permit a working tensile stress of at least twenty tons per square inch, must be reliably tough so that it might be shaped any way and stressed in any complex way without playing tricks, must keep its properties at any temperature met with in applied thermodynamics, must not corrode with any of the ordinary everyday chemicals (including air), must withstand erosion under the demands of the engineering of the time, and have, perhaps, half-a-dozen other qualities, must have relative economic accessibility, and last, but not least, must keep its condition until the machine became entirely obsolete.

It was doubtful if such a metal was really wanted. Heat treatment, which figured so largely in modern metallurgy, was in his considered opinion as an engineer a movement in the wrong direction. Metals in the most stable form were really desired, and that form was not to be found in what he might call the "highly strung."

Death of Mr. A. C. Chapman

Loss to the Profession of Public Analysts

Mr. Alfred Chaston Chapman, F.R.S., F.I.C., died on Monday, October 17, at his home at Hampstead in his sixty-third year. He was educated at Leeds Grammar School and at University College, London, where he studied chemistry under Professors A. W. Williamson and Charles Graham, and physics under Professor Carey Foster, and was senior demonstrator in applied chemistry for a year before he began to practise in London as a consulting and analytical chemist in 1888, while he was yet under age. From that time onwards he contributed numerous papers to the "Transactions of the Chemical Society," the "Analyst," the "Journal of the Institute of Brewing," and other publications dealing with subjects covering a wide range of pure and applied chemistry, his work being recognised by his election in 1920 as a Fellow of the Royal Society. In that year he delivered the Cantor Lectures of the Royal Society of Arts, on "Micro-organisms and their Industrial Uses."

Mr. Chapman was a vice-president of the Royal Institution in 1931; a member of the Board of Studies in Chemistry of



The late Mr A. Chaston Chapman.

the University of London; a member of the scientific panel of the Board of Trade under the Safeguarding of Industries Act; and a member of the Advisory Committee on Plant and Animal Products of the Imperial Institute. He was honorary secretary of the Society of Public Analysts from 1899 to 1914, and president for the two years following; president of the Institute of Brewing from 1911 to 1913; and president of the Institute of Chemistry from 1921 to 1924, having previously served as an examiner in general chemistry and in biological chemistry to that body. In 1921 he was appointed a member of the Royal Commission on Awards to Inventors, from that year until 1926 he was a member of the Forest Products Research Board to the Department of Scientific and Industrial Research, and from 1931 a member of the Chemistry Research Board. In 1928 to 1930 he served on the Government Committee for ethyl petrol. He was an honorary member of the Société de Zymologie Pure et Appliquée of Belgium, a vice-president of the jury at the International Exhibition at Brussels in 1910, and honorary professor, Ecole Supérieure de Brasserie, Ghent. He was a British delegate to the conference in Paris in 1910 on uniform methods for expressing the results of the analysis of food products, and represented British societies at international and other congresses.

Australian Benzol Trade

AUSTRALIAN consumption of benzol is supplied from both domestic and foreign sources. The output of three principal manufacturers aggregates about 470,000 imperial gallons, although the capacity of one producer alone is figured at 1,200,000 imperial gallons. The output is absorbed largely by firms marketing motor-fuel blends. Exports are negligible. Imports are rather small (14,557 gallons in 1930-31).

Ottawa Concessions Affecting the Chemical Industry

The Indian Agreement

LAST week we published a summary of the agreements reached at the Imperial Economic Conference at Ottawa in so far as they related to the chemical industry, including extracts from the schedule of chemicals in the Canadian agreement showing the extent of the preferences to be accorded to British products. Mr. J. Davidson Pratt, general manager and secretary of the Association of British Chemical Manufacturers, has now issued a summary of the chemicals and allied products included in the India agreement on which India will grant a preference of 10 per cent.

In the case of Canada the headings in the agreement represent, on the 1930 data, total imports valued at between 20 and 25 million dollars, of which in 1930 the United Kingdom secured only 3 to 3½ million dollars. Thus it will be seen that there is trade approaching 20 million dollars which the United Kingdom will have a better opportunity of competing for than in the past. Taking into consideration all the factors of the case, however, such as the close proximity of the United States, the cost of transport from this country, etc., the feeling of the Association is that if British chemical manufacturers are able to secure another 4 million dollars' worth of trade they will have done very well indeed.

Opportunities in India

Following are the principal items on which India will grant a preference of 10 per cent. The particulars of imports in the year ended March 31, 1931, give some indication of the opportunities for United Kingdom trade.

	Imports year ended	
	March 31, 1931.	
	Total.	From U.K.
	Rupees.	Rupees.
Tartaric acid	3,99,713	35,430
Other acids (except acetic, carbolic, citric, salicylic and tartaric).		
This heading would appear to include:—		
*Nitric acid	98,826	19,513
*Sulphuric acid	99,898	10,431

Acids, other sorts excluding exceptions specified.	2,14,859	58,784
Anhydrous ammonia	2,80,320	1,27,985
Other ammonia and salts thereof ...	5,75,105	3,53,884
Disinfectants other than naphthalene	8,20,861	5,21,235
Bichromate of Potash	1,29,384	52,303
Potassium compounds, other sorts (except chlorate and cyanide) ...	4,71,658	1,41,222
Bichromate of soda	2,73,372	1,75,059
Sodium cyanide	3,59,819	3,15,332
Caustic soda	27,20,595	21,10,908
Sodium carbonate (soda ash and soda crystals)	64,51,855	56,41,925
Sodium compounds, other (except bicarbonate, borax, and sodium silicate).		
This heading appears to include:—		
*Sodium sulphide	2,56,716	30,484
Other sorts, other than items specified	4,17,339	1,00,062
Other sorts of chemicals (except those indicated above as separately distinguished and except alum, arsenic, calcium carbide, glycerine, lead compounds, ferrous sulphate, magnesium compounds, sulphur and zinc compounds.		

This heading would appear to include:—

*Aluminium sulphates	2,14,338	89,261
*Bleaching powder	8,93,038	4,95,777
*Bleaching materials, other sorts ...	1,33,433	1,20,379
*Copper sulphate	2,38,842	2,02,342
Other sorts of chemical not specifically distinguished	48,76,549	17,50,191
*Quinine, sulphite or bisulphate ...	15,21,696	6,08,979
*Quinine, hydrochlorate or dihydrochloride	3,52,613	1,88,124
*Other sorts of quinine salts	4,13,789	65,736

[* Appeared at first sight from the examination of the annual statement of sea borne trade in British India to be subject to the 10 per cent. preference, but it has now been found that they are not so liable in virtue of the exceptions at the top of Schedule F on page 82 of CMD. 4174. They should therefore be deleted from this list.]

Drying and Non-Drying Oils

Need for Better Knowledge of the "Drying" Mechanism

THE Manchester Section of the Oil and Colour Chemists' Association, held their first meeting of the session in the Manchester College of Technology on Friday, October 14, when Dr. J. J. Sleightholme contributed a paper on "The drying and non-drying of oils." Mr. Hancock presided.

In the course of his paper, Dr. Sleightholme referred to the need for a thorough knowledge of the constitution of the raw material used. No really satisfactory account of the composition of the acids from linseed oil had yet appeared, still less had the glyceride structure been revealed. Whereas fairly satisfactory analyses of tung oil acids had been forthcoming from independent sources, there was no detailed knowledge of its glyceride structure. Further the composition of any one kind of oil might vary, sometimes within fairly wide limits and those limits required to be fixed. The phenomenon of gelation introduced a further complication and greatly hindered the separation and characterisation of the products of oxidation. Any explanation of what he called "non-drying" or the action of anti-oxygens must, of necessity, come after the elucidation of the drying process, since discussion of the catalysis of an unknown reaction could hardly be anything better than rash speculation. It is necessary to know, first the constitution of the drying oils, then the action of gaseous oxygen, and finally the mechanism of the process of catalysis, either positive (as in the case of driers) or negative (as in the case of inhibitors of the reaction). The work of Kaufmann, who attempted the analysis in detail of linseed oil fatty acids was subjected to very severe criticism by Van Loon and Van der Veen, whose objections were quite justified.

In the absence of accurate knowledge of the initial material, investigations using the natural products as initial materials were scarcely logical at present. It had been generally recognised, however, that the first result of the absorption of oxygen at a double linkage was the formation of a peroxide at the double linkage. The peroxide group, however, quickly underwent a further change, the nature of which was unknown. Morrell and Marks had shown that when oxygen was passed through a solution of β -elaeostearin in benzene a gel was obtained. They stated that the iodine value of the resulting gel proved the existence of one double bond in each acidic radicle but the iodine value could not be regarded as a very reliable guide since 178-183 was given as the value for β -elaeostearin, the true iodine value of which was about 262. The amount of iodine liberated by the peroxide in the gel was never as high as would be expected if all the oxygen absorbed had remained in the peroxidic state, but indicated that one of the peroxide groupings in each chain had disappeared. In place of the peroxide group a carbonyl and a hydroxyl group had appeared.

Commenting upon the sudden drop in iodine value as shown by Elm's work, Dr. Sleightholme said it might possibly be due to the formation of association polymers; in fact Elm regarded the polymers as purely association and not condensation products. That conclusion was based upon the fact that if a dried film were dissolved in acetone, benzene or carbon tetrachloride, no chemical differences between the soluble and insoluble portions were found. Regarding investigations on polymerisation by the joining together of mole-

cules at double bonds he said that molecules of unsaturated acids occupied a greater area on the surface of the water than did those of the corresponding saturated acids. Langmuir explained that by suggesting that the double bonds were attracted by water. In regard to that, the area occupied by the molecule was governed by the part which was above the surface and not by that dragged down under the water since an acid, its mono-glyceride and mono-glycolide had the same molecular area. Possibly polymerisation took place on account of that attraction to some extent and to some extent also owing to the polarity exhibited by the peroxide group in an oxidised oil. The former method was considered to preponderate in the case of heat-thickened oils and probably also played a considerable part in the drying of an ordinary untreated oil.

Prolonging the Induction Period

In regard to the non-drying of oils, the action of many substances, notably hydroquinone, in prolonging the induction period, or the time during which a fat was only very slowly attacked by gaseous oxygen or air, had received a

great deal of attention, though the commercial applications had been more notable in the rubber industry than elsewhere. It had been found that the refining of maize oil lowered its induction period and it was originally thought that the sterole might be responsible for the induction period. Later, Mattill stated that purified cholesterol or sitosterol did not act as anti-oxygens but suggested that some other constituents of the unsaponifiable matter, possibly connected with the vitamin activity played in that part. Cod liver oil, rich in fat-soluble vitamins as well known, was found to have an induction period of 70 minutes at 100° C., while tung oil and linseed oil had only very small induction periods at that temperature. Attempts which had been made to suggest a practical application of anti-oxygens to arrest the deterioration of paint films seemed to be based on illogical foundations, for the composition of a dry paint differed considerably from that of the fresh material and there was no evidence to show that an inhibitor of the first reaction between an unsaturated oil and gaseous oxygen would prevent absorption of oxygen by the gel finally produced, if indeed the ultimate breakdown of a film was due only to further oxidation and not to internal rearrangement or saponification.

Research in the Rubber Industry

Problems of Fabric Impregnation with Rubber

At a meeting of the London and District Section of the Institution of the Rubber Industry, Miss Huenemoerder and Dr. E. A. Hauser, of Germany, presented a paper dealing with their work on problems of fabric impregnation with rubber. This paper disclosed that considerable progress has been made in the use of latex direct for this purpose, the latex having been specially adapted by the use of dispersing agents, etc. A year or two back, Dr. Hauser expressed the belief that it was theoretically and practically impossible to obtain complete impregnation by the use of plain or concentrated latex alone, and he maintains that that still holds good. Hence, his work on the use of adapted latex.

In the course of the discussion, Dr. P. Schidrowitz, who presided, said that if we could produce by means of latex a proofing material similar to that made in the ordinary manner, obviously the textile factories would leave the rubber waterproofers absolutely cold. When one could do a thing with latex successfully it was as a rule so much easier and simpler and needed so much less plant than was needed with ordinary rubber, and we opened up fields of activity for the people outside the rubber industry proper. Most of the more important applications of latex were relevant to industries other than the rubber industry proper, as, for instance, the textile industry, the boot and shoe industry, and so on. It behoved rubber manufacturers and those who were interested in the manufacture of rubber goods to pay rather more attention to these new developments. There had been so many failures of attempts to do with latex what we now know to be impossible, that many rubber manufacturers had become shy of latex, and he believed that they did not yet appreciate that we had reached a stage at which we could say what we could and could not do successfully with latex. Having reached that stage of discrimination, the rubber industry would be well advised to pay the greatest attention to these developments.

Annual Meeting of the Scottish Section

The third annual general meeting of the Scottish Section of the Institution of the Rubber Industry was held in Glasgow, October 12, when Mr. A. Ryan, of the Ioco Rubber Co., presided. In his opening remarks Mr. Ryan gave an interesting account of the work of the Scottish Section for the past year together with a general résumé of the educational classes which have been conducted by Mr. Duncan of the Craigpark Electric Cable Co., Glasgow. Office bearers for the ensuing session were elected as follows:—A. Ryan, president; W. Cameron, vice-president; R. Clark, secretary; Committee: Messrs. Guest, Martin, Nuttall, Ruch, Smith and Williams.

At the conclusion of the formal business E. P. Smith gave an interesting paper on "Automatic Controls in the Rubber

Industry," in which he brought to their notice certain items of equipment which are in standard use in America but as yet have not found ready acceptance in this country. The principal items dealt with were (1) boiler controls; (2) calendering; (3) curing; and (4) hydraulic control.

Speaking generally the last thing the management tackled in any economy campaign was the question of boiler control, yet considerable economies could be made in this direction. A drop in boiler efficiency of a few per cent. represented a considerable waste of fuel annually—and the drop was greater when hand firing was in use. Since the introduction of pulverised fuel the use of automatic stokers had largely increased, and the next material step was the development of automatic controls. The various systems available differed somewhat in the method of master control. Some were of the completely electrical type such as the Siemens Halske, Leeds Northrup, Bailey and Industrial Combustion Engineers; others were of the fluid operated type, such as the Carrick, Smoot and the Hagen system. Mr. Smith gave a detailed description of the Siemens Halske system, the main features of which are the ingenious use of the "Wheatstone" bridge principle to maintain the correct relation between the principal controls; the master controller consisting of a very sensitive steam pressure gauge; and a CO₂ controlling device for maintaining the correct relation between fuel and air. On extended tests carried out in a power station the increase in efficiency, where a CO₂ indicator was installed was 12 per cent. With a boiler using 8 tons of coal per day this loss would represent a ton of coal.

Calendering and Curing

Calendering in many products was an operation necessitating absolute accuracy and uniformity, and to-day when accuracy to thousands of an inch were required, waste and loss was inevitable with human control. Some kind of automatic control had become a necessity and engineers were successfully tackling the problem. The best known automatic calendering gauging devices were the Schuster Magnetic thickness gauge of the Magnetic Gauge Co., and the McChesney mechanical gauge. The former instrument was of the electromagnetic type and was stated to measure a difference of 0.0001 inch.

Automatic curing control was desirable owing to the detrimental effects of wrong curing which resulted from batteries of curing units being left in the control of unskilled men. Conditions of temperature and pressure were important considerations; one being essential for perfect vulcanisation and the other to avoid porosity. The need for temperature control was emphasised by the fact that many moulded articles were of thick section and built up by assembly of rubbers of different qualities necessitating a gradual heat soaking before the maximum curing temperatures was required.

News from the Allied Industries

Rubber

THERE WAS A FALL OF 1,152 TONS in United Kingdom stocks of raw rubber last week, bringing them down to 101,560 tons, the lowest total since May, 1930. The stock figure at this time last year was 133,980 tons.

Pottery

CONFIRMATION OF THE STATEMENT that trade in the pottery industry is improving is shown by the monthly figures issued by the employment exchanges in the Potteries. The latest return reveals that well over 3,000 more operatives have been employed during the past four weeks compared with the previous month.

Artificial Silk

IMPROVED RESULTS are shown in the report for the year to July 2, 1932, of British Celanese, Ltd. The trading profit rose from £995,240 to £1,471,892, and to this is added £24,490, "other income," and £57,106, sundry reserves and contingency provisions no longer required. The total of £1,553,488 enables the company, after providing for the service of the Debenture issues, to write off £126,577 for research and advertising expenditure 1929-1932 and £12,452 for new issue expenses, to wipe out the debit of £99,385 brought in, and to carry forward a credit of £14,591.

Mineral Oil

THE BRITISH-BORNEO PETROLEUM SYNDICATE, Ltd., will close their transfer books from October 26 to November 4, with a view to the offer to the shareholders of the unissued capital. The authorised capital is £250,002, of which 150,000 in 6s. shares has been issued. It was announced in July that an arrangement had been entered into with the Anglo-Persian Oil Co., by which that company will participate jointly with the syndicate in the exploration of the Elm concession in the State of Brunswick, under the technical direction of the Anglo-Persian Oil Co.

Non-Ferrous Metals

THE FERRY TINPLATE WORKS, Britonferry, has re-started work after nine months' idleness, and 250 employees will have returned to work by the end of the week. The Gwalia Tinplate Works are to restart in ten days' time.

STOCKS OF TIN in Great Britain declined last week by about 140 tons, to 31,278 tons. The greater part of the decrease occurred in the Liverpool stocks. Home warehouse stocks of copper have been increasing; last week's returns show a total of 27,816 tons. It seems that consignments of foreign metal are coming in in rather large quantities, in anticipation of the proposed duty being enforced shortly.

Paper

SINCE THE DISSOLUTION of the Scandinavian mechanical pulp cartel last April prices have declined to such an extent that sales are being made at a loss. An attempt is therefore being made to revive the cartel, or, if this is not possible, to establish some sort of co-operation between Scandinavian producers through having a uniform curtailment of production, so that there will be a more even balance between supply and demand. The initiative is being taken by a group in Sweden, which not only controls a large part of the production but is very strong financially.

THE OTTAWA TRADE AGREEMENTS with Australia and New Zealand forbid the removal of the present 10 per cent. duty on imported casein, and coated paper-makers are not pleased with the prospect of paying this duty on the material they have to import for a future period of at least five years. There arises, however, the position of a number of imported paper-making materials which are still dutiable and in respect of which no arrangement appears to have been made at Ottawa which would tie the hands of the Advisory Committee. Many mills are very anxious to see materials of which they are large users added to the free list so that they may gain real benefit from the duties which have been imposed on imported papers.

Sugar

AS THE RESULT OF AN AGREEMENT reached between the Cuban and Java sugar producers at the International Sugar Council meeting at the Hague the Cuban sugar crop is to be restricted to 2,000,000 tons.

Iron and Steel

BRITISH PRODUCTION OF PIG-IRON in September amounted to 260,400 tons, states the National Federation of Iron and Steel Manufacturers, compared with 259,400 tons in August and 248,200 tons in September, 1931. The output of steel ingots and castings in September amounted to 430,300 tons, compared with 361,500 tons in August (when production was affected by holidays), and 400,500 tons in September, 1931. There were 59 furnaces in blast at the end of September, a net increase of two since the beginning of the month, four furnaces having commenced operations and two having been blown out.

Murex, Ltd.

Competition Reported to be More Severe

THE thirteenth ordinary general meeting of Murex, Ltd., was held yesterday at Winchester House, Old Broad Street, E.C., on October 17. Mr. Geo. P. Joseph, the chairman, said that the balance sheet showed a surplus of liquid assets of £55,425. The trading profit for the year amounted to £54,525, as against £48,665 for the previous year. Owing to the continued depression in foreign countries, and especially to the unprecedented exchange restrictions throughout the world, their business, in common with practically every other concern trading abroad, had suffered. That tendency had been accentuated during the latter part of their financial year, and showed as yet no sign of improvement. It was inevitably accompanied by a falling off in the turnover and profit derived from their export trade, which they must be prepared to meet until conditions became more normal, when, he did not doubt, they would be able to retain their share of that business.

The home trade in Murex products and the sale of electrodes for the year showed an expansion, and although the competition had become more severe and there had been a substantial reduction in price, they had been successful in increasing their turnover and the number of their customers in the home market. During the year, important additions had been made to the Murex Welding Processes factory at Walthamstow, and a new building, the framework of which was welded throughout, had been erected.

The available balance was £62,181. An interim dividend at the rate of 15 per cent., less tax, had been paid, and the directors recommend a final dividend on the ordinary shares of 20 per cent., less tax, the same as last year.

International Road Tar Conference

Visit to Testing Laboratories

FORTY delegates from Britain, France, Germany, Spain, Belgium, Switzerland and other countries met in London on October 10 and 11 for the Plenary Session of the International Road Tar Conference, of which Sir David Milne-Watson is president. The conference was inaugurated about two years ago, so that road experts from all over Europe could meet and exchange views on the use of tar for the construction and maintenance of roads. On October 10, the delegates visited the Harmondsworth Laboratories of the Ministry of Transport, where an opportunity was afforded of inspecting the work which is being carried out by the Ministry with regard to the chemical and physical properties of bituminous road mixtures. On October 11 a visit was made to the Chemical Research Laboratory, Teddington. The British Road Tar Association have entered into a co-operative arrangement with the Department of Scientific and Industrial Research for the conduct of research at this laboratory under the direction of Professor G. T. Morgan, and the delegates were interested in the general programme of research work which is being carried out on road tar.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

The following notes on the chemical market conditions in Great Britain are based on direct information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

Prices in the London chemical market have remained fairly steady during the week and the improved demand continues. There has been no change in the market for coal tar products. Without any further actual expansion in the volume of business going through in the Manchester market, the demand for chemicals during the past week has been about maintained at the slightly improved level of the past few weeks, although there is still no general tendency on the part of users to venture far ahead. With regard to prices, offers this week have been on a generally steady basis, with few alterations of any importance to record. Business in the Scottish market still continues to be steady, but quantities are small.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £37 5s. to £39 5s.; pure 80% £38 5s. to £40 5s.; tech., 40%, £19 15s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. SCOTLAND: Glacial 98/100%, £48 to £50; pure 80%, £38 5s.; tech. 80%, £37 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in one-ton lots upwards.

ACID, CHROMIC.—11d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. 0½d. per lb. LONDON: 10½d. less 5%. MANCHESTER: 10½d.

ACID, CRESYLIC.—97/99%, 1s. 5d. to 1s. 7d. per gal.; 99/100%, 1s. 9d. to 2s.

ACID, FORMIC.—LONDON: £51 per ton.

ACID, HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s per ton; 50% by weight, £28 10s.; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £20 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £45 10s. per ton in casks, £48 10s. to £52 10s. in kegs. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £46, ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations: 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—10½d. per lb. SCOTLAND: B.P. crystals, 11½d. to 1s., less 5%, carriage paid. MANCHESTER: 10½d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON: £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb. d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £36 per ton; powdered, £38, in 5-cwt. casks d/d U.K. stations or f.o.b. U.K. ports.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammuniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammuniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £22 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 4d. to 1s. 6d. per lb. according to quality.

ARSENIC.—LONDON: £22 10s. c.o.f. main U.K. ports for imported material; Cornish, nominal, £26 f.o.r. mines. SCOTLAND: White powdered £27 ex wharf; spot, £27 10s. ex store. MANCHESTER: White powdered Cornish, £24 10s. at mines.

ARSENIC SULPHIDE.—Yellow 1s. 6d. to 1s. 8d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£7 10s. per ton f.o.r. London, packages free.

BLEACHING POWDER.—Spot 35/37% £7 10s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated £15 10s. per ton, power £17, packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—3s. 2d. to 3s. 6d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot £5 5s. to £5 15s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—4d. to 5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £45 per ton, drums extra.

CHROMIUM OXIDE.—10d. to 10½d. per lb. according to quantity d/d U.K. Green 1s. 2d. per lb.

CHROMETAN.—Crystals 3½d. per lb. Liquor £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 5s. per cwt.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£46 to £50 per ton.

LEAD ACETATE.—LONDON: White, £34 per ton. Brown, £1 per ton less. SCOTLAND: White Crystals £40 to £41 c.i.f. U.K. ports. Brown, £1 per ton less. MANCHESTER: White, £31; Brown, £30.

LEAD NITRATE.—£28 per ton. MANCHESTER: £27 to £28.

LEAD, RED.—SCOTLAND: £28 10s. per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £40 per ton carriage paid.

LITHOPONE.—30%, £18 to £19 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£52 per ton d/d.

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PHENOL.—Small lots, 6½d. per lb. in 3-cwt. drums, bulk quantities down to 6d. per lb., delivery free U.K.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £39 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CARBONATE.—SCOTLAND: 96/98% spot £28 per ton ex store. LONDON: £31 10s. to £32. MANCHESTER: £30.

POTASSIUM CHLORATE.—3½d. per lb. ex wharf London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99½/100% powder, £34. MANCHESTER: £36.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8½d.; B.P., 9d.

POTASSIUM PRUSSIAN.—LONDON: 8½d. to 9d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £6 per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77% spot, £14 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums £18 15s. in casks. Solid 76/77% £14 10s. in drums 70/72% £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £12 15s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 to £22 per ton.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£30 per ton.

SODIUM CHROMATE.—3½d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals £15 ex station 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM NITRITE.—Spot, £19 to £22 per ton d/d station in drums.
 SODIUM PERBORATE.—LONDON: 10d. per lb.
 SODIUM PHOSPHATE.—£13 to £15 per ton.
 SODIUM PRUSSIAN.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 5d. to 6d.
 SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station returnable drums.
 SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
 SODIUM SULPHATE (SALT CAKE).—Unground Spot £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
 SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums. Crystals Spot £7 15s. per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11 10s.; commercial, £8.
 SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot £9 10s. d/d station in bags.
 SULPHATE OF COPPER.—MANCHESTER: £16 to £16 10s. per ton f.o.b.
 SULPHUR.—£12 per ton. SCOTLAND: Flowers, £12 10s.; roll, £12; rock, £9. Ground American, £12 ex store.
 SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
 SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
 VERMILION.—Pale or deep, 4s. 6d. to 4s. 11d. per lb.
 ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
 ZINC SULPHATE.—LONDON and SCOTLAND: £12 per ton.
 ZINC SULPHIDE.—1s. to 1s. 2d. per lb.

Pharmaceutical and Fine Chemicals

ACID, TARTARIC.—10½d. per lb.
 ACID, PYROGALLIC, CRYST.—6s. 9d. per lb.
 IODINE RESUB., B.P.—14s. 8d. to 18s. 9d. per lb.
 IODOFORM, B.P., CRYST., PRECIP., OR POWDER.—17s. 7d. to 21s. 7d. per lb.
 MENTHOL.—A.B.A., RECRYST. B.P.—11s. 9d. per lb.
 POTASS. IODIDE, B.P.—13s. to 15s. 6d. per lb.
 SODIUM IODIDE, B.P.—14s. to 17s. 1d. per lb.
 TERPINEOL.—1s. 6d. per lb.
 SODIUM CITRATE, B.P.C. 1911.—1s. 3d. per lb.; B.P.C. 1923 and U.S.P., 1s 7d per lb.
 VANILLIN.—Ex clove oil, 16s. to 18s. per lb. Ex Guaiacol, 14s. 3d. to 16s. 3d. per lb., including packing and delivery free U.K.

Essential Oils

ANISE.—2s. 2d. per lb.
 CAMPHOR, WHITE.—00s. per cwt.
 CANANGA, JAVA.—8s. per lb.
 CASSIA, 80/85%.—4s. 9d. per lb.
 CITRONELLA OIL, JAVA.—3s. 1½d. per lb.; CEYLON, 2s. 3d. per lb.
 EUCALYPTUS, AUSTRALIAN B.P., 70/75%.—1s. 1d. per lb.
 LEMONGRASS.—2s. 9d. per lb.
 PEPPERMINT.—Japanese, 4s. 6d. per lb., Wayne County, 12s. per lb.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
 ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
 ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
 ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
 ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
 ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
 ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
 BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
 BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
 o-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.
 m-CRESOL 98/100%.—2s. 3d. per lb., in ton lots.
 p-CRESOL 34.5° C.—1s. 9d. per lb., in ton lots.
 DICHLORANILINE.—2s. per lb.
 DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
 DINITROBENZENE.—8½d. per lb.
 DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 9d. per lb.
 DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
 α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
 β-NAPHTHOL.—Spot, £75 per ton in 1-ton lots, d/d buyer's works.
 α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
 β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
 o-NITRANILINE.—5s. 10d. per lb.
 m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
 p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
 NITROBENZENE.—Spot, 5d. per lb.; 5-cwt. lots, drums extra.
 NITRONAPHTHALENE.—9d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
 o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
 p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.
 m-XYLIDINE ACETATE.—3s. 6d. per lb., 100%.

Coal Tar Products

ACID, CARBOLIC (CRYSTALS).—6d. to 6½d. per lb. Crude, 60's 3% water, 1s. 11d. per gal. SCOTLAND: Sixties, 1s. 7d. to 1s. 8d.
 ACID, CRESYLIC.—99 100, 1s. 7d. per gal.; B.P., 1s. 9d. to 1s. 11d.; Refined, 1s. 7d. to 1s. 9d.; Pale, 98%, 1s. 5d. to 1s. 7d.; Dark, 1s. 2d. to 1s. 3d. LONDON: 98 100%, 1s. 6d. Dark 95/97%, 1s. 4d. SCOTLAND: Pale 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.
 ANTHRACENE OIL.—Strained, 4½d. per gal.
 BENZOL.—At works, crude, 10d. to 11d. per gal.; standard motor, 1s. 6½d. to 1s. 7d.; 90%, 1s. 7d. to 1s. 8d.; pure, 1s. 10d. to 1s. 11d. LONDON: Motor, 1s. 7½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.
 CREOSOTE.—Standard for export, 4½d. to 5d. nett per gal. f.o.b. for Home, 3½d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. LONDON. MANCHESTER: 3d. to 4d. SCOTLAND: Specification oils, 3½d. to 4½d.; washed oil, 4d. to 4½d.; light, 3½d. to 4½d.; heavy, 4½d. to 5d.
 NAPHTHA.—Solvent, 90/160, 1s. 4d. to 1s. 5d. per gal.; 95/160, 1s. 8d.; 90/190, 1s. 1d. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160, 1s. 3d. to 1s. 3½d.; 90/190, 11d. to 1s. 2d.
 NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaker, £10 per ton. Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 6s. to 70s.
 PITCH.—Medium soft, £4 7s. 6d. to £5 per ton.
 PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 3s. to 4s.
 REFINED COAL TAR.—SCOTLAND: 4½d. to 5d. per gal.
 XYLOL.—1s. 9d. to 2s. per gal.; Pure, 1s. 10d. to 2s. 2d.
 TOLUOL, 90%.—2s. to 2s. 4d. per gal.; Pure, 2s. 6d. to 2s. 8d. per gal.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. per ton. Grey, £10 10s. Liqueur, brown, 30° Tw., 6d. per gal. MANCHESTER: Brown, £8 10s.; grey, £11 5s.
 ACETIC ACID, TECHNICAL, 40%.—£16 10s. to £18 10s. per ton.
 AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.
 CHARCOAL.—£6 to £11 per ton.
 WOOD CREOSOTE.—6d. to 2s. per gal., unrefined.
 WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 4s. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.
 WOOD TAR.—£2 to £6 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price for October shipment is unchanged at £4 12s. 6d. per ton f.o.b. U.K. port in single bags, and for November shipment the price is £4 15s. per ton. The home price is £5 5s. per ton for delivery up to June 30, 1933, in 6-ton lots delivered to farmer's nearest station.

NITRATE OF SODA.—The home price remains unchanged at £8 9s. per ton for October delivery, the November delivery price being £7 10s. per ton, delivered in 6-ton lots to farmer's nearest station.

NITRO-CHALK.—The price of £7 5s. per ton delivered in 6-ton lots remains in force for delivery up to June 30, 1933.

Latest Oil Prices

LONDON, Oct. 19.—LINSEED OIL was firm. Spot, small quantities, £19 10s.; Oct., £16 15s.; Nov.-Dec., £17 5s.; Jan.-April, £18; May-Aug., £18 17s. 6d. per ton, naked. RAPE OIL was inactive. Crude extracted, £29; technical refined, £31 per ton, naked, ex wharf. COTTON OIL was quiet. Crude extracted, £22 10s.; refined common edible, £24 10s.; and deodorised, £26 10s. per ton, naked, ex wharf. TURPENTINE was firm. American, spot, 63s. per cwt.

HULL.—LINSEED OIL.—Spot, £17; Oct., £16 10s.; Nov.-Dec., £16 15s.; Jan.-April, £17 12s. 6d.; May-Aug., £18 10s. per ton. CORBON OIL.—Egyptian crude, spot, £23; edible refined, spot, £24 10s.; technical, spot, £24 10s.; deodorised, £26 10s. per ton, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £22 10s. per ton, naked. GROUNDNUT OIL.—Crushed-extracted, spot, £31; deodorised, £35 per ton. RAPE OIL.—Crushed-extracted, spot, £28 10s.; refined £30 per ton. SOYA OIL.—Crushed-extracted, spot, £23 10s.; deodorised, £26 10s. per ton. COD OIL, 15s. 6d. per cwt. TURPENTINE.—American, spot, 64s. per cwt. CASTOR OIL.—Pharmacy, spot, 42s.; first, 37s.; second, 32s. per cwt.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

The following information is prepared from the Official Patents Journal. Printed copies of Specifications Accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Applications

- MANUFACTURE OF AZO DYESTUFFS INSOLUBLE IN WATER ON THE FIBRE. W. W. Groves (*I. G. Farbenindustrie*). June 24, 1931. 381,580.
- PRODUCTION OF ARTIFICIAL MOULDED MATERIALS FROM CELLULOSIC MATERIALS AND BINDERS. Naamloze Vennootschap Histoxyl Maatschappij Histoma. June 28, 1930. 381,583.
- CATALYSTS FOR USE IN THE OXIDATION OF METHYL ALCOHOL. W. J. Tennant (*Bakelite Corporation*). July 2, 1931. 381,570.
- SUBSTITUTED NAPHTHALENE DERIVATIVES. Imperial Chemical Industries, Ltd., W. Bradley, and R. Robinson. July 10, 1931. 381,602.
- MANUFACTURE AND PRODUCTION OF HYDROXY KETONES. J. Y. Johnson (*I. G. Farbenindustrie*). Sept. 5, 1931. 381,686.
- MANUFACTURE AND PRODUCTION OF THERMOPLASTIC POLYMERISATION PRODUCTS FROM INDENE, OR STYRENE, VINYL ACETATE, AND LIKE MONO-VINYL COMPOUNDS. J. Y. Johnson (*I. G. Farbenindustrie*). Sept. 15, 1931. 381,693.
- METHOD OF RELIEVING ALKALINE WASTE LIQUORS FROM THE SODA OR SULPHATE PULP MANUFACTURE OF SILICA. E. L. Rinman. Sept. 19, 1931. 381,697.
- PROCESS FOR ABSORBING OLEFINS IN STRONG ACIDS. Naamloze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 4, 1930. 381,723.
- PRODUCTION OF CHLOROCRESOLS. I. G. Farbenindustrie. Oct. 29, 1930. 381,728.
- MANUFACTURE OF AZO DYESTUFFS. Soc. of Chemical Industry in Basle. Dec. 1, 1930. 381,767.
- PROCESS FOR THE MANUFACTURE OF UNSPLINTERABLE GLASS. L. T. Levey. April 2, 1931. 381,855.
- PROCESS FOR PRODUCING BISMUTH SODIUM GLUCONATE, AND PRODUCTS THEREBY OBTAINED. H. N. Skerrett (*Drug Products Co., Inc.*). April 14, 1932. 381,863.
- PROCESS AND PLANT FOR THE DISTILLATION OF BITUMINOUS SCHISTS. Soc. des Schistes et Petroles de Franche Comte. May 19, 1931. 381,881.

Complete Specifications open to Public Inspection

- PROCESS FOR THE DECOLORISATION OF GLASS. Deutsche Gasglublicht-Auer-Ges. Oct. 10, 1931. 32129/31.
- PROCESS FOR CONVERTING FERTILISER SALTS OR POTASSIUM CHLORIDE INTO STORABLE AND READILY DISTRIBUTABLE FORM. Kali-Forschungs-Anstalt Ges. Oct. 6, 1931. 6041/32.
- 1-PHENYL-2, 3-DIMETHYL-4-ALKYL-5-PYRAZOLONES AND PROCESS FOR THE MANUFACTURE OF SAME. F. Hoffmann-La Roche and Co. Akt.-Ges. Oct. 9, 1931. 25351/32.
- PROCESS FOR THE PRODUCTION OF VALUABLE PRODUCTS FROM OLEFINS. Naamloze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 6, 1931. 25613/32.
- PROCESS FOR THE PREPARATION OF A TYPE OF FIBROUS CELLULOSE ESTER. C. F. Boehringer and Soehne Ges. Oct. 5, 1931. 27542/32.
- MANUFACTURE OF STABILISED DIAZO SOLUTIONS. I. G. Farbenindustrie. Oct. 5, 1931. 27579/32.
- MANUFACTURE OF WATER-INSOLUBLE AZO DYESTUFFS. I. G. Farbenindustrie. Oct. 5, 1931. 27580/32.
- PRODUCTION OF CARBON-FREE ALLOYS. Heraeus-Vacuumschmelze Akt. Ges. Oct. 9, 1931. 27712/32.
- PROCESS FOR THE MANUFACTURE OF VALUABLE PRODUCTS BY POLYMERISATION OF UNSATURATED HYDROCARBONS. Naamloze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 8, 1931. 27714/32.
- MANUFACTURE OF DYESTUFFS. E. I. Du Pont de Nemours and Co. Oct. 7, 1931. 27800/32.
- PROCESS FOR THE MANUFACTURE OF ESTERS OF THE LEUCO COMPOUNDS OF VAT DYESTUFFS. I. G. Farbenindustrie. Oct. 7, 1931. 27818/32.
- MANUFACTURE OF THIOUREA. Soc. of Chemical Industry in Basle. Oct. 6, 1931. 27840/32.
- MANUFACTURE OF PRODUCTS SUITABLE FOR USE AS WASHING, WETTING-OUT, EMULSIFYING, DISPERSING, PEPTISING, FOAMING, CLEANSING, AND LIKE AGENTS. Deutsche Hydrierwerke Akt.-Ges. Oct. 6, 1931. 27852/32.

Applications for Patents

- MANUFACTURE AND PRODUCTION OF DYESTUFFS. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 3. 27403.
- REFINING OILS AND FATS. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 3. 27404.
- MANUFACTURE OF 1,9-ANTHRAPYRIMIDINES. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 5. 27682.
- MANUFACTURE OF ETHYLATED DIAMINO AND POLYAMINO-ANTHRAQUINONES. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 5. 27683.
- TREATMENT OF ANIMAL HIDES. I. G. Farbenindustrie. Oct. 3. (Germany, Oct. 3, '31.) 27426.
- MANUFACTURE OF STABILISED DIAZO SOLUTIONS. I. G. Farbenindustrie. Oct. 4. (Germany, Oct. 5, '31.) 27579.
- MANUFACTURE OF WATER-INSOLUBLE AZO-DYESTUFFS. I. G. Farbenindustrie. Oct. 4. (Germany, Oct. 5, '31.) 27580.
- MANUFACTURE OF ESTERS OF LEUCO COMPOUNDS OF VAT DYESTUFFS. I. G. Farbenindustrie. Oct. 6. (Germany, Oct. 7, '31.) 27818.
- HYDRATING OR DEHYDRATING REACTIONS. Imperial Chemical Industries, Ltd. Oct. 5. 27703.
- MANUFACTURE OF RESIN-LIKE PRODUCTS. Imperial Chemical Industries, Ltd. Oct. 6. 27843.
- PRODUCTION OF 1-HALOGENATED BENZTHIAZOLES, ETC. J. D. Kendall. Oct. 6. 27861.
- PRODUCTION OF AROMATIC THIO-ACYL-AMINO BODIES, ETC. J. D. Kendall. Oct. 6. 27862.
- PERFORMING CHEMICAL REACTIONS UNDER PRESSURE. Metallges. Akt.-Ges. Oct. 7. (Germany, Dec. 17, '31.) 28014.
- ELECTRODEPOSITION OF METALS OF THE PLATINUM GROUP. Mond Nickel Co., Ltd. Oct. 3. 27421.
- PROCESS FOR MANUFACTURE OF VALUABLE PRODUCTS BY POLYMERISATION OF UNSATURATED HYDROCARBONS. Naamloze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 5. (Holland, Oct. 8, '31.) 27714.
- MANUFACTURE OF BLACK AND COLOURED PRINTERS' INKS, AND PRODUCTS OBTAINED THEREBY. Naamloze Vennootschap Handelsmaatschappij "Baber." Oct. 3. 27423.
- EXTRACTION OF SUGAR FROM SUGAR BEET, ETC. H. W. K. Pears. Oct. 6. 27804.
- PRODUCTION OF ALKYLATED CYCLO-HEPTANONES, ETC. Soc. Anon. M. Naef et Cie. Oct. 7. (Switzerland, Oct. 30, '31.) 27931.
- CONVERSION OF KETONES INTO UNSATURATED ALDEHYDES. Soc. Anon. M. Naef et Cie. Oct. 7. (Switzerland, Oct. 30, '31.) 27932.
- MANUFACTURE OF THIOUREA. Soc. of Chemical Industry in Basle. Oct. 6. (Switzerland, Oct. 6, '31.) 27840.
- MANUFACTURE OF DYESTUFFS. Soc. of Chemical Industry in Basle. Oct. 7. (Switzerland, Oct. 12, '31.) 27968.
- RECOVERY OF SULPHUR. R. F. Bacon. Oct. 13. (United States, Dec. 7, '31.) 28600.
- ROASTING PYRITES FINES. R. F. Bacon. Oct. 13. (United States, Nov. 21, '31.) 28601.
- EXTRACTION OF ELEMENTS FROM COMPOUNDS THEREOF. Beryllium Development Corporation. Oct. 13. (United States, Oct. 23, '31.) 28035.
- PRODUCTION OF METAPHOSPHATES FOR USE IN BAKING POWDERS. Chemische Fabrik Budenheim Akt.-Ges. Oct. 10. (Germany, Oct. 10, '31.) 28227.
- ASPHALTIC EMULSIONS. F. B. Dehn (*International Bitumen Emulsions Corporation*). Oct. 13. 28640.
- CATALYTIC DEHYDRATION PROCESSES. E. I. Du Pont de Nemours and Co., and C. H. Greenwalt. Oct. 13. 28580.
- MANUFACTURE OF PREPARATION CONTAINING ESSENTIAL ELEMENTS OF PLANTS. J. Francon. Oct. 10. (France, Oct. 10, '31.) 28203.
- MANUFACTURE OF AMINOALKYLSULPHONIC ACIDS, ETC. W. W. Groves (*I. G. Farbenindustrie*). Oct. 10. 28197.
- PURIFICATION OF HYDROCARBONS. E. G. Hancock, W. H. Hoffert, and National Benzole Co., Ltd. Oct. 14. 28785.
- SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS. I. G. Farbenindustrie. Oct. 10. (Germany, Oct. 10, '31.) 28194.
- MANUFACTURE OF HALOGENATION PRODUCTS OF ACENAPHTHINDIONE DIKETIMIDES. I. G. Farbenindustrie. Oct. 10. (Germany, Oct. 10, '31.) 28195.
- MANUFACTURE OF HIGHLY-VISCOUS PRODUCTS. I. G. Farbenindustrie. Oct. 12. (Germany, Oct. 12, '31.) 28462.
- MANUFACTURE OF SYMMETRICALLY SUBSTITUTED AZOBENZENE COMPOUNDS. I. G. Farbenindustrie. Oct. 14. (Germany, Oct. 17, '31.) 28770.
- MANUFACTURE OF AZO DYESTUFFS. I. G. Farbenindustrie. Oct. 14. (Germany, Oct. 17, '31.) 28771.
- CONVERSION OF MASSES OF WAXES, ETC., INTO COMPARATIVELY SMALL PIECES. I. G. Farbenindustrie. Oct. 14. (June 29.) (Germany, Nov. 11, '31.) 28772.
- POLYMETHANE DYESTUFFS. Imperial Chemical Industries, Ltd., and J. S. H. Davies. Oct. 10. 28174.
- ARTIFICIAL RESINOUS COMPOSITION. Imperial Chemical Industries, Ltd., and H. A. Hampton. Oct. 12. 28496.
- COLOURING MASSES CAPABLE OF BEING MOULDED. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 12. 28468.
- MANUFACTURE OF HYDROCARBONS RICH IN CARBON FROM THOSE POORER IN CARBON. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 12. 28499.
- MANUFACTURE OF LUBRICATING GREASES. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 15. 28846.
- PRODUCTION OF ARTIFICIAL RESIN FROM RESITE MASSES. Naamloze Vennootschap Philips' Gloeilampen-fabrieken. Oct. 11. (Germany, Oct. 12, '31.) 28349.

From Week to Week

THE COAL UTILISATION COUNCIL has appointed Mr. W. R. Gordon as its director.

THE WILLIAM MATHESON BURSARY in chemistry at St. Andrew's University, of the value of £50 for one year, has been awarded to Charles F. Griffith, of Carlisle.

THE TREATMENT of Great Bear Lake pitchblende is likely to be in progress about the middle of October at the Port Hope (Ontario) refinery of Eldorado Gold Mines, Ltd., and radium production is likely about the end of the year.

THE SULPHATE OF COPPER SECTION of the Mond Nickel Works, Clydach, Swansea (writes our Welsh correspondent), will resume operations on November 1. Between 300 and 350 men will be employed.

AS THE POLISH NAPHTHA INDUSTRIALISTS have not voluntarily established a naphtha syndicate, the Polish Government has now formed by decree such a syndicate for the export of naphtha products. The organisation has been placed under the Ministry for Industry and Trade.

AN IMPORTANT DISCOVERY by which sea water can be used instead of carbonate of soda in the manufacture of nitrate is reported by the Norwegian newspaper "Morgenbladet." The discovery is claimed by a young Norwegian chemist employed by the Norsk Hydro Company, which has for many years produced nitrate by reduction of the nitrogen in the air. The use of sea water eliminates a raw material which the company have had to import from abroad, and will lead to considerable economy in the cost of production.

THE 22ND ANNUAL EXHIBITION OF SCIENTIFIC INSTRUMENTS and apparatus will be held in London, January 3-5, 1933. Offers of exhibits for the research and experimental section are invited for the consideration of the committee. The section is divided into two groups: Group A, exhibits illustrating recent physical research, and Group B, lecture and instructional experiments in physics. Offers should be addressed to the Exhibition Secretary, 1 Lowther Gardens, Exhibition Road, London, S.W.7.

THE Foster Instrument Co., of Letchworth, has now opened a London demonstration room at 74 Victoria Street, S.W.1, where a complete range of industrial and research instruments comprising thermo-couple, optical and radiation pyrometers and also electrical "distance" thermometers will be available together with a working demonstration of automatic temperature controllers. The exhibit will be managed by Mangin, Davison and Partners, Ltd., who will have an experienced engineer in attendance to advise on temperature measurement and control problems.

THE REDWOOD MEDAL of the Institution of Petroleum Technologists has been presented to Dr. Edeleanu, for his discovery and development of the process of extracting mineral oils by means of liquid sulphur dioxide. Mr. J. Kewley, the president, who made the presentation, stated that in early life Dr. Edeleanu worked in England as assistant to Professor Hodgkinson at the Royal Artillery College. In 1889 he returned to Roumania, and carried on his organic chemistry research. In describing his process, Dr. Edeleanu said he anticipated that before long their industry would be fully involved in the manufacture of chemical products, and at that time the liquid sulphur dioxide heating process would, he believed, be a main manufacturing phase.

WORKING IN CO-OPERATION WITH REFINERY ENGINEERS of the United States Bureau of Mines, O. H. Schoenwald and G. M. Ford have developed a method of removing hydrogen sulphide from natural gas, based on reaction with lime. Treatment of the gas to remove the hydrogen sulphide was accomplished by scrubbing the gas with a solution of sodium chloride and calcium hydroxide. The salt solution appreciably increases the solubility of lime in water up to a certain percentage, and thus a smaller volume is required to remove a given amount of hydrogen sulphide. The treating plant consisted essentially of a scrubbing device for contacting the gas with the solution and a series of tanks for making up or settling the treating solution.

IN THE KING'S BENCH DIVISION on Tuesday, a settlement was arrived at in the action of Simonis against the British Industrial Gases. The matter came before Mr. Justice Acton, when Mr. Harold Murphy, who appeared for the plaintiff, explained that his client was an expert technical adviser in acetylene and oxygen and had been associated with the British Oxygen Co. The action arose out of an anonymous circular sent by the defendants to shareholders in the company criticising proposals of the directors. The name of the plaintiff was mentioned in that circular as if he was behind it. The defendant company realising the injury which had been inflicted on the plaintiff, had made adequate recompense to him and paid the costs. The plaintiff was not responsible for the circular and at the time was unable to find out who was. Mr. Frank Powell, for the defendant company, said that his clients desired to express regret that the circular was published, and they also apologised to the plaintiff, who was not in any way connected with the circular. His lordship directed the record to be withdrawn upon the terms agreed.

THE CHILEAN GOVERNMENT is considering an offer from the Guinazu Co. of Buenos Ayres to exchange 200,000 tons of petrol for nitrate and copper.

MANGANESE AND ITS PROGRESSIVE USE IN INDUSTRY was the subject of a lecture by Mr. P. Bonds at the first winter meeting of the Cornish Institute of Engineers, held at Camborne on October 15.

A MONUMENT TO ERNEST SOLVAY, to whom was due the creation of the International Institute of Chemistry and Physics and the Institute of Physiology, was unveiled in Brussels this week in the presence of the King of the Belgians and the Duke of Brabant.

THE INAUGURAL MEETING of the 179th session of the Royal Society of Arts, and presentation of the medals awarded during the session 1931-1932 will be held on November 2. Mr. J. A. Milne, chairman of the council of the Society, will deliver an address on "Beauty in Industry."

MR. T. G. WATTS, manager of the Maritime By-Product Works, Pontypridd, Glamorgan, has been appointed manager of the Powell Duffryn By-Product Works at Tredamen, Rhymney Valley. Last week Mr. Watts was the recipient of presentations from the directors, staff and workmen of the Maritime Works.

PROFESSOR ALFRED FOWLER and Sir Clement D. M. Hindley, have been appointed members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research in place of Sir J. Alfred Ewing and Sir David Milne-Watson, who have retired on completion of their terms of office. Brigadier-General Sir Harold B. Hartley has been appointed chairman of the Fuel Research Board, and Mr. N. V. Sidgwick chairman of the Chemistry Research Board of the Department of Scientific and Industrial Research, in place of the late Sir Richard Threlfall.

PROFESSOR J. A. CROWTHER has been elected hon. secretary of the Institute of Physics to succeed Professor A. O. Rankine. Professor Crowther was for many years a lecturer at Cambridge, and was appointed Professor of Physics in the University of Reading in 1924, and he is now also Dean of the Faculty of Science of that University. At the meeting of the board of the Institute on October 11, the following were elected to membership: Fellows: B. Moore, B. Venkatesachar, T. S. Wheeler and W. Rule; Associates: K. F. Earp, E. G. Jones, and T. J. Rees.

THE FIRST HINCHLEY MEMORIAL LECTURE is to be delivered before the Institution of Chemical Engineers, by H. T. Tizard, F.R.S., rector of the Imperial College of Science and Technology, whose subject will be "Chemical Engineering and the Aircraft Industry." The lecture will be delivered in the lecture theatre of the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, on Friday, October 28, when the president, Viscount Leverhulme, will take the chair at 6.30 p.m. Non-members will be welcome, for whom tickets may be had on application to the assistant secretary of the Institution.

PERSONS IN LONDON and other parts of the country have been calling upon traders and representing themselves to be officers of the Board of Trade or of the Register of Business Names, and obtaining money for the alleged purpose of registering their business names under the Registration of Business Names Act, 1916, or of rectifying some omission in the registration under the Act. Traders are warned that such representations are untrue and are made with the object of obtaining money by false pretences. They should, therefore, have no dealings with any person calling upon them with reference to the Act and purporting to be an officer of the Board of Trade or of the Registrar of Business Names. Traders can obtain information as to their obligations under the Registration of Business Names Act, 1916, direct from the Registrar of Business Names, Prince's House, Kingsway, London, W.C.2.

Books Received

- Economic Conditions in East Africa and in Northern Rhodesia and Nyasaland.** (Sept. 1930 to March 1932). Report by Colonel W. H. Franklin. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 82. 2s. 9d.
- Economic Conditions in the Dominion of New Zealand to April, 1932.** Report by L. A. Paish. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 108. 3s.
- Natural Varnish Resins.** By T. Hedley Barry. London: Ernest Benn, Ltd. Pp. 294. 42s.
- Perfumes, Cosmetics and Soaps.** By W. A. Poucher. Vol. II. London: Chapman and Hall. Pp. 600. 30s.
- Prout's Hypothesis.** Alembic Club Reprints No. 20. London: Gurney & Jackson. Pp. 58. 2s. 6d.
- The A B C of Chemistry.** By J. G. Crowther. London: Kegan Paul, Trench, Trubner and Co. Pp. 248. 4s. 6d.
- The Free Energies of Some Organic Compounds.** By George Sutton Parks and Hugh Martin Huffman. New York: Chemical Catalog Co. Pp. 250. \$4.50.
- The History of the Phlogiston Theory.** By J. H. White. London: Edward Arnold. Pp. 192. 6s.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

MOND NICKEL CO., LTD., London, S.W. (M., 22/10/32.) Registered Oct. 5. Trust Deed dated Sept. 23, 1932, supplemental to Trust Deeds dated July 31, 1925, etc., securing £1,251,099 inclusive of £1,070,000 deb. stock already reg.; charged on properties comprised in principal deed, also general charge. *£1,331,197. June 8, 1932.

RHODES BRYDON AND YOUATT, LTD., (late Rhodes Brydon and Co., Ltd., and Rhodes Cochrane and Co., Ltd.), Stockport, millwrights. (M., 22/10/32.) Registered, Oct. 7, £1,500 (not ex.) deb., to Martins Bank, Ltd.; general charge. *Nil. July 17, 1931.

Satisfaction

INDUSTRIAL COLLOIDS, LTD., Manchester, chemists. (M.S., 22/10/32.) Satisfaction registered Oct. 6, £300, registered May 23, 1932.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

ABLEY, GEOFFREY, Physics Department, Military College of Science, Red Barracks, Woolwich, laboratory steward. (C.C., 22/10/32.) £21 4s. 0d. Sept. 5.

S. V. S., LTD., 40 Rectory Road, Stoke Newington, art dyers, etc. (C.C., 22/10/32.) £18 17s. 9d. June 20.

TURNER AND COLEMAN, Park Road, Aston (trading as Premier Dye Works), dyers and cleaners. (C.C., 22/10/32.) £21 19s. 0d. July 11.

MIDLAND RUBBER CO., 103/7, Godwin Street, Bradford, rubber dealers. (C.C., 22/10/32.) £20 10s. 2d. Sept. 5.

Company News

Southall Brothers and Barclay.—An interim dividend of 5 per cent., tax free, is announced on the ordinary shares.

United Premier Oil and Cake Co..—The dividend on the preference shares for the half-year to June 30 last is payable on October 20.

Andersons' Rubber.—No interim dividend on ordinary shares is being paid in respect of quarter ending October 19, but this matter will be reviewed on November 19.

Sub Nigel, Ltd..—A total working profit of £831,964 for the year to June 30 last is reported, compared with £708,451 in the previous twelve months. The annual meeting will be held in Johannesburg on November 3.

United Molasses Co..—The interim report covering the six months to June 30 last, states that operations have resulted in a net profit of approximately £45,000. This compares with a deficit of £185,000 for the corresponding period of 1931.

Sadler & Co..—Report for year ended June 30 states that balance standing at credit of profit and loss, including undivided balance brought forward, is £9,578 (against £10,997). Directors propose dividend of 5 per cent., less tax.

Edgar Allen & Co..—In view of the continued uncertainty of trade conditions the directors are of the opinion that it is still necessary to conserve the company's financial resources in every possible way. Payment of the dividend on the cumulative preference shares in respect of the half-year ending September 30, 1932, will therefore be deferred. The dividend on these shares is in arrear from April 1, 1931.

American Smelting and Refining.—Accounts for half year to June 30, show net income from current operations, after providing for all taxes, but before providing for bond interest, depreciation, obsolescence, depletion and inventory revaluation, \$2,969,937, deduct bond interest \$880,306, depreciation and obsolescence \$2,089,771, ore depletion \$329,406, and re-valuation of metal stocks in excess of normal \$3,112,501, leaving net loss for period of \$3,442,047.

Burt, Boulton, and Haywood.—The report for the year ended June 30 last, states that the net profit was £45,800 to which is added £13,918 brought forward, making £59,718. From this £31,835 has been appropriated for payment of preference dividend, interim on the ordinary shares and interim on the workers' certificates, leaving £27,883. The directors recommend a final dividend of 4 per cent., less tax, on the ordinary shares, making 8 per cent., less tax, and a final distribution on the workers' certificates of £534, carrying forward £6,558.

Alliance Artificial Silk.—Report for fifteen months to March 31 states that it is hoped to submit concrete proposals for financial reorganisation at early date. Directors are satisfied that with capital reorganisation and provision of necessary finance, company can operate on very satisfactory profit-earning basis. Accounts show loss on sale of plant and machinery £7,835, loss on loans and advances to Artificial Silk Processes £15,658, and settlement of action for acetate deliveries £51,962, making total for development expenditure of £149,277, to which should be added debit on profit and loss account £26,654, making £175,931.

Chemical Trade Inquiries

Abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Germany.—A firm established at Hamburg wishes to obtain the representation of United Kingdom manufacturers of chemicals, drugs, vegetable oils and earth colours, on a commission basis. Correspondence may be in English. (Ref. No. 525.)

South Africa.—H.M. Senior Trade Commissioner in South Africa reports that the South African Railways and Harbours Administration is calling for tenders (Tender No. 2099), to be presented in Johannesburg by November 14, 1932, for the supply of approximately 22,300 lb. of tallow. (Ref. B.X. 7440.)

Australia.—A manufacturers' agent and indenter of Melbourne, Australia, is at present in England, and wishes to get into touch with British suppliers of chemicals, druggists' sundries, etc. Communications should be addressed in the first place to the Commercial Officer, Australia House, Strand, London, W.C.2. (Ref. 417/7/1/680.)

Forthcoming Events

- Oct. 22.**—North of England Institute of Mining and Mechanical Engineers. Lecture Theatre, Newcastle-on-Tyne. 2.30 p.m.
- Oct. 24.**—Society of Chemical Industry (Yorkshire Section), Institute of Chemistry (Leeds Section). "Industrial Solvents." F. W. Clark. 7.15 p.m. Great Northern Hotel, Leeds.
- Oct. 26.**—Alchemists' Club. "Symbiosis." Professor J. Graham Kerr. 7.30 p.m. Glasgow University.
- Oct. 26.**—Leicester Literary and Philosophical Society, Chemistry Section. Lecture by Dr. L. H. Lampitt. 8 p.m.
- Oct. 27.**—Institution of the Rubber Industry (Midland Section). "Latex Round Thread—Its Manufacture and Properties." E. A. Murphy. Grand Hotel, Leicester.
- Oct. 27.**—Institution of the Rubber Industry (London and District Section). Joint meeting with the Royal Aeronautical Society. "Aeroplane Covers and Wheels." F. Fellowes. 6.30 p.m. Royal Society of Arts, John Street, Adelphi, London.
- Oct. 28.**—Society of Dyers and Colourists (Scottish Section). "Training of the Textile Colourist." Dr. H. H. Hodgson. 7.15 p.m. 235 Buchanan Street, Glasgow.
- Oct. 28.**—Oil and Colour Chemists' Association. Dance. Palace Hotel, Bloomsbury Street, London.
- Oct. 28.**—Institution of Chemical Engineers. First Hinchley Memorial Lecture. "Chemical Engineering and the Aircraft Industry." H. T. Tizard, F.R.S. 6.30 p.m. Institution of Civil Engineers, Great George Street, London.
- Oct. 28.**—Manchester Literary and Philosophical Society (Chemical Section). "A New Photo-Electric Photometer and its Applications." Dr. R. Guelke. 7 p.m. 36 George Street, Manchester.
- Oct. 28.**—Society of Chemical Industry (Liverpool Section). "Chemistry and Nutrition." W. Ramsay Sibbald. Liverpool University. 6 p.m.
- Oct. 29.**—Institute of Metals (Birmingham Section). Dinner and Dance. Queen's Hotel, Birmingham.
- Oct. 29.**—Soirée promoted by the Associated Learned Societies of Liverpool and District. 6-10 p.m. Central Technical School, Byron Street, Liverpool.

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EDUCATIONAL

HARRISON MEMORIAL PRIZE.

IN accordance with the Trust Deed governing the Harrison Memorial Fund, the Selection Committee consisting of the Presidents of the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry and the Pharmaceutical Society, will proceed to make an award of the Harrison Prize in December next.

The Prize, of the value of about £150, is to be awarded to the chemist of either sex, being a natural born British subject and not at the time over thirty years of age, who, in the opinion of the Selection Committee, during the previous five years has conducted the most meritorious and promising original investigations in any branch of pure or applied chemistry and published the results of those investigations in a scientific periodical or periodicals.

Provided that, in the opinion of the Selection Committee, there is a candidate of sufficient distinction to warrant an award of the Prize, the next award is to be made in December, 1932.

Applications, five copies of which must be submitted, should contain the following information:—

- Name (in full);
- Age (birth certificate to accompany application);
- Degrees (name of University where obtained);
- Other qualifications;
- Experience;
- Titles of published papers, with authors' names, including full references to publication;
- Where research was carried out;
- Testimonials or references;
- Any other information bearing on the application.

The Selection Committee is prepared to receive applications, nominations, or information as to candidates eligible for the prize. Any such communication must be received by

The President,
The Chemical Society,
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not later than Thursday, December 1, 1932.

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